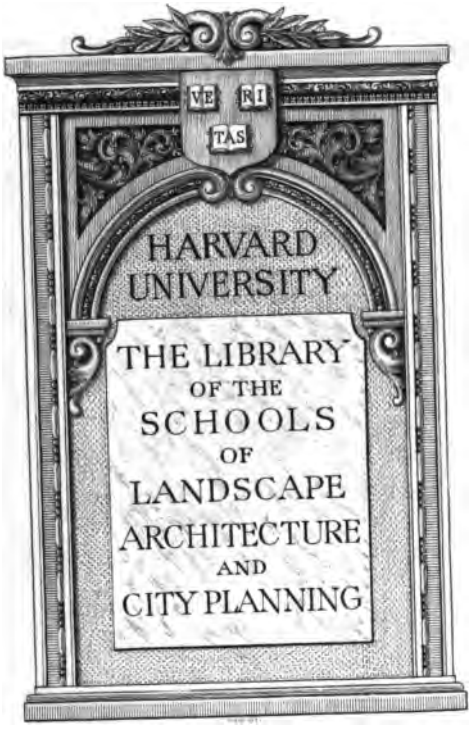
Boston Transit Commission

Twenty-second Annual Report

June 30, 1916.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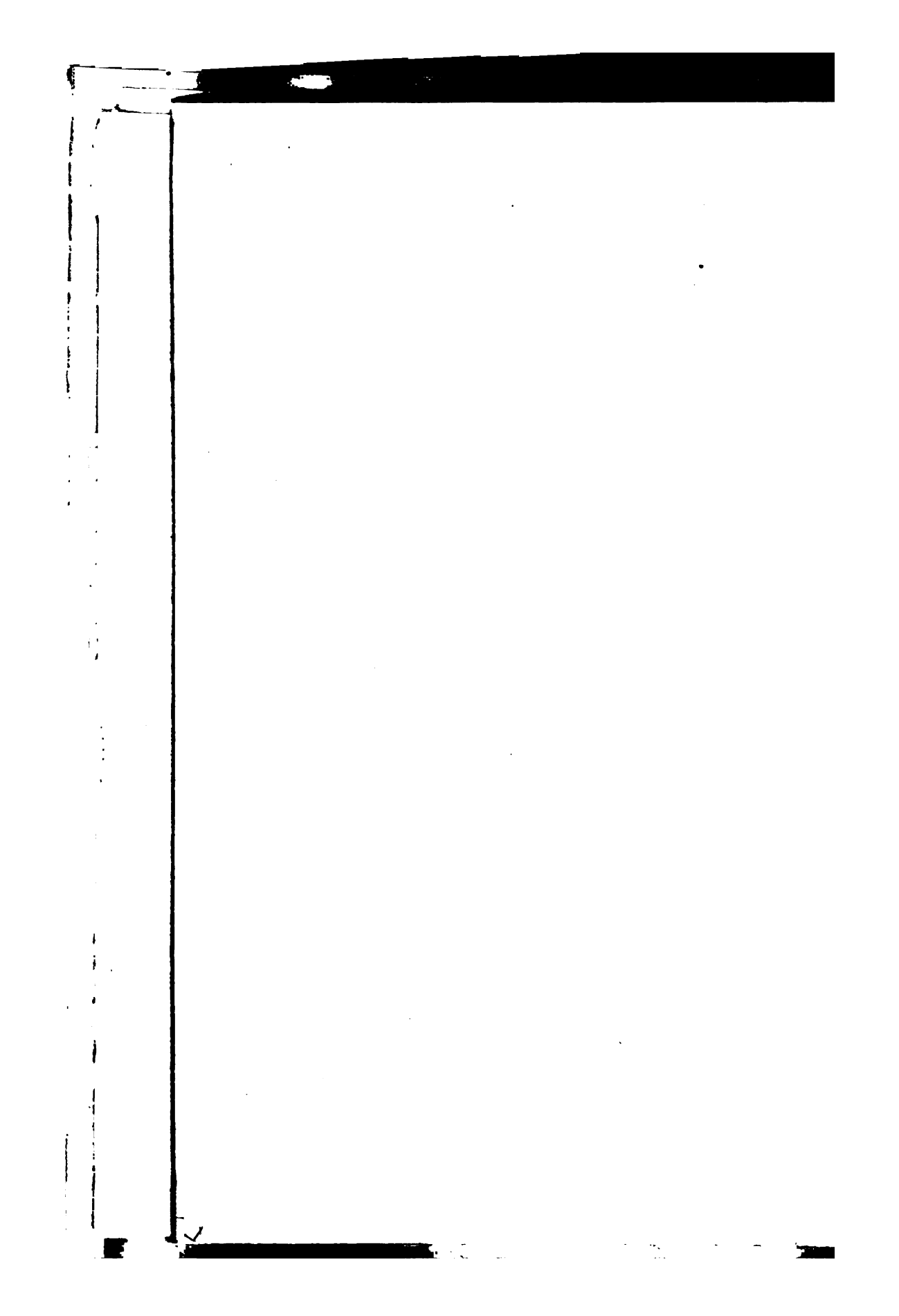


TWENTY-SECOND ANNUAL REPORT

OF THE

BOSTON TRANSIT COMMISSION,

FROM

THE BOSTON TRANSIT COMMISSION,

15 Beacon Street

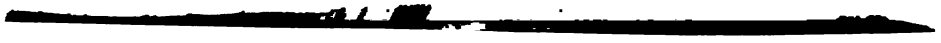
GEORGE F. SWAIN, *Chairman.*

HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Commissioners.

EDMUND S. DAVIS,
Chief Engineer.

B. LEIGHTON BEAL,
Secretary.

Boston
PURITAN LINOTYPE, Printer
152 Purchase Street
1916



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FOR THE YEAR ENDING

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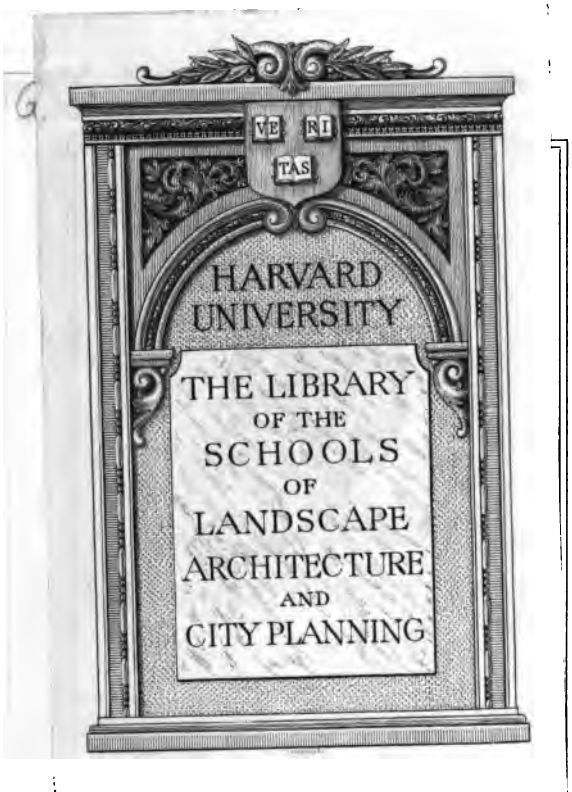
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BOSTON TRANSIT COMMISSION

15 Beacon Street, Boston, June 30, 1916.

To the City Council of the City of Boston:—

In compliance with Statutes of 1894, chapter 548, section 24, the report of the Boston Transit Commission for the year ending June 30, 1916, is respectfully submitted.

Dorchester Tunnel.

The Dorchester tunnel is completed as far as the southerly end of Section E, the section under Fort Point Channel, with the exception of a small part of one tube of that section. The remaining part of the tunnel is all under contract, and it is expected that the entire work will be finished on or before July 1, 1917.

To facilitate the work of the contractors on various sections, and in consequence of agreements between those contractors and the Boston Elevated Railway Company, the Commission has granted temporary locations for the tracks of the Company in B, C and E streets and in Rawson and Washburn streets.

During the work under Fort Point Channel, a point was approached where the channel was found to be deeper than shown on the plans, bringing the roof of the tunnel dangerously near the bottom, having in view the use of compressed air, and the possibility of seams of pervious material which might allow the escape of air. To obviate this possible danger, permission was secured from the War Department to deposit a blanket of clay over this portion, giving the necessary thickness of overhead material to support the air pressure. This blanket is to be removed by the contractor before the completion of his work.

Details of the work of the various contractors will be found in the report of the Chief Engineer.

Use of Compressed Air.

In April, 1916, the Commission requested its Chief Engineer to report as to the precautions taken by the contractors for the employees engaged in work under compressed air, and as to the manner of enforcing these precautions. The report of the Assistant Engineer in charge of this section of the work thereon is as follows:—

BOSTON TRANSIT COMMISSION,
15 BEACON STREET,
BOSTON, April 10, 1916.

MR. E. S. DAVIS, *Chief Engineer.*

DEAR SIR:—In accordance with your request for a report as to the methods and precautions observed on account of the use of compressed air on Section E of the Dorchester Tunnel, I beg leave to submit the following.

All the men who work in compressed air are examined and passed by a physician who is employed by the Insurance Co. with which the McGovern Co. has placed its liability insurance for this work. This examination is supposed to be, and in general is made before the men begin work, although there may be an occasional case where a man is not examined until after having worked a short time.

A Field Hospital with a trained nurse in daily attendance is maintained on the work, where minor injuries of all kinds are attended to. A physician usually spends about an hour a day at the hospital treating cases that the nurse cannot take care of.

Comfortable dressing rooms with lockers and shower baths, etc., have been provided for all men working in compressed air. The men are served with hot coffee when they come out of the tunnels, and coffee is also sent into the tunnels at lunch time during the middle of the shifts.

There is a medical air lock in the power house, where cases of "bends" can be treated. However, most of the men suffering from bends, unless prevented, will go back into the tunnels instead of into the hospital lock.

The tunnels south of West First street have been kept under a pressure of about 14 lbs. gauge. The pressure in the tunnels under the channel has varied from time to time up to a maximum of 28 lbs. gauge, the average being about 20 lbs. gauge. No particular trouble, so far as I know, has resulted from the use of 14 lbs. air pressure in the south tunnels or in the tunnels under the channel at pressures below 15 lbs. and no particular regulations for decompression have been observed up to this point.

A considerable number of cases of "bends" have occurred on this work after the air pressures reached about 18 lbs. gauge or over, but there have been very few serious cases and so far as I know only one fatal case that is attributable to compressed air. This latter case occurred during the few weeks when it was necessary to keep the "A" tunnel under a pressure of 26 to 27 lbs.

The minimum time taken to decompress from the tunnel pressure is regulated by means of reducers on the valves. These reducers are usually fixed for what is considered a safe time for men coming out of the tunnels who have only been inside for an hour or less. There are a considerable number of men on the work whose duties only keep them inside the tunnels for short periods at a time. In locking out men who have worked half a shift or more, the lock tenders are supposed to increase the minimum time of decompression by throttling the valves. A reasonably safe time for decompression is difficult to determine accurately as apparently compressed air troubles depend upon a number of things such as individual susceptibility, cold, fatigue, etc.

For a time the contractor's men decompressed from 18 to 20 lbs. in about four to five minutes, and a considerable number of cases of "bends" resulted, (none of them serious as far as I know). Later this time was increased to about six minutes, and this time gave much better results, although occasionally some men still had trouble. At pres-

ent about seven minutes is taken by the contractor's employees to decompress from 20 lbs. When the pressure was 26 lbs. the minimum time was from ten to twelve minutes.

Among the Commission's men there have been seven cases of "bends" since the work started, one man having them three times, and four other men once each. In these cases the symptoms were more or less severe pains in the joints, principally the knees. The pains passed off in a day or two, and none of the men lost more than about a day's time from this cause.

The Commission's men have been advised to take about one minute for each pound that the tunnel pressure exceeds 12 lbs gauge. This rule appears to be safe, except in cases of unusual susceptibility, as that of John Miller, who was affected three times, although taking all the precautions that the other men took.

Much more trouble has been experienced from ear, nose and throat afflictions than from "bends," and a very considerable amount of time has been lost by the Commission's men and also by the Contractor's employees on this account.

Yours truly,

(Signed) G. D. EMERSON,
Asst. Engr.

The following letter in relation thereto was sent to P. McGovern & Co., contractors for that section:

BOSTON TRANSIT COMMISSION,
15 BEACON STREET,
BOSTON, April 13, 1916.

MESSRS. P. MCGOVERN & CO., *Tremont Building, Boston.*

GENTLEMEN:—The Commission has had under consideration the question of adequate protection of the health of the men working in compressed air on your contract, and desires to urge upon you the importance of making sure that all reasonable precautions are taken and enforced. Among these reasonable precautions one is that no man should be allowed to work in compressed air except after a thorough examination by a competent physician, who certifies to the man's fitness to work under the conditions existing. The Commission believes that this precaution should be rigidly adhered to.

A second precaution is to require the time of decompression to be not less than one minute for each pound that the tunnel pressure exceeds 12 lbs. gauge pressure. This is the rule which has been adopted for the employees of the Commission, and it appears to be a safe rule, except in cases of unusual susceptibility and the Commission recommends that you adopt such a rule for your employees and take means to secure its enforcement.

The Commission is aware of the fact that you maintain a field hospital and adequate dressing rooms. This letter is sent not from a desire to find fault with your work, but from a desire to impress upon you the importance of continued vigilance and supervision.

Yours very truly,

(Signed) GEO. F. SWAIN,
Chairman.

Use as far as South Station.

On Tuesday, June 27th, the following letter was sent to the Boston Elevated Railway Company in relation to the equipment of the Dorchester tunnel as far as South Station Under.

BOSTON TRANSIT COMMISSION,
15 BEACON STREET,
BOSTON, June 27, 1916.

BOSTON ELEVATED RAILWAY COMPANY,
WILLIAM A. BANCROFT, *President.*

GENTLEMEN:—I am instructed by the Commission to notify you that, in its opinion, its work at South Station Under, Dorchester Tunnel, will be so nearly completed by July 5th, 1916, that the Company can begin its equipment of the station and approaches at that date.

Yours respectfully,
(Signed) B. LEIGHTON BEAL,
Secretary.

The Company replied as follows:

BOSTON ELEVATED RAILWAY COMPANY,
PRESIDENT'S OFFICE,
101 MILK STREET, BOSTON, MASS.
June 28, 1916.

B. LEIGHTON BEAL, ESQ., *Secretary Boston Transit Commission,*
1 Beacon Street, Boston, Massachusetts.

DEAR SIR:—Your communication of June 27th in re opening of South Station Under, Dorchester Tunnel, is at hand, and has been submitted to the Executive Committee of the Board of Directors.

Respectfully,
(Signed) WM. A. BANCROFT, *President.*

Under the authority given by Chapter 376, Special Acts of 1915, the Commission has planned the Broadway station so that surface cars will descend to the subway level for the more convenient transfer of passengers and at both this station and at Andrew square, has taken property on the surface so that both of these stations will become prepayment stations.

In connection with the construction of the entrances and exits to and from the station at Dewey Square both the Commission and the Boston Elevated Railway Company were very desirous of arranging for a passageway leading from the tunnel station into the South Terminal station, passing under the main entrance at the corner of Atlantic avenue and emerging at some point in the main concourse. Several plans were made for such a physical connection with the steam railroad station and conferences were held with the officers of the Boston Terminal Company.

The Commission was, however, unable to reach any agreement with the officers of the Terminal Company providing for a physical connection into the South Station, and the entrances to the tunnel were therefore located on the sidewalks of Atlantic avenue and Summer street, as near as practicable to the main entrance to the railroad station, and the awnings over the sidewalks will be extended so as to make the passage from the tunnel entrances into and exits from the railroad station under cover.

Escalators have also been provided which will bring passengers from the Dewey Square station to the level of the sidewalk, an advantage which would not have been possible had a physical connection been made with the concourse of the Terminal station.

BOYLSTON STREET SUBWAY.

The Boston Elevated Railway Company has asked the Commission to exercise the authority given to it by Chapter 376, Special Acts of 1915, and to incur the expense necessary to construct a prepayment station in connection with the Massachusetts avenue station of the subway. Such a prepayment station would be so designed that interchange between surface cars and subway cars could be made under cover and without paper transfers, and all surface cars would be so routed as to pass through the enclosed area of said station. Various plans for such a station have been studied by the Commission, but no action has as yet been taken.

The Legislature of 1916 passed an additional act, Chapter 342, Special, in relation to Arlington street station. This act will be found in Appendix A.

A request has been received from the Park & Recreation Department that the Commission construct a fence on the Boylston street side of the Public Garden to take the place of that which was removed when the location of the subway incline was changed from the Public Garden to Boylston street. Plans for such a fence and an estimate of cost thereof have been obtained, but the matter of the advisability of such replacement is still under discussion.

EAST BOSTON TUNNEL EXTENSION.

All the work of the Commission upon the East Boston Tunnel Extension was completed early in 1916. On March 17th members of the Legislature, various public officials, engineers, street railway men and others interested, made an official inspection trip through the extension, which was opened to public travel the following day.

REAL ESTATE.

Settlements for lands taken for various departments of work of the Commission have been made, as follows:

DORCHESTER TUNNEL.

166-190 Dorchester avenue	William P. Morse (Est. of Benjamin Leeds, mortgagee)
8-20 Summer street	Samuel Carr et als.

BOYLSTON STREET SUBWAY.

Public Alley 444	Flora A. Ginty
344 Newbury street	Mary S. Ames, et al.
346 Newbury street	A. W. Preston
352 Newbury street	William A. Paine
354 Newbury street	George R. White

EAST BOSTON TUNNEL EXTENSION.

23-25 Cambridge street	John F. McNamee, Tr.
27-33 Cambridge street	M. A. Moore, et als. Tr.
95-101 Cambridge street	John B. Osborn
105 Cambridge street	Julia M. Dehon
2-6 Bowdoin square	A. C. Ratchesky et al. Trs.
18-20 Bowdoin square	Prop. of Revere House
88-92 Court street	Peter Bent Brigham Hospital
179-185 Court street	Adreas Blume, et al. Trs.

LEGISLATION.

Four matters were passed during the last session of the Legislature affecting the work of the Commission.

Chapter 342, Special Acts "An Act to provide for the construction of an additional station in the Boylston Street Subway in the City of Boston." Appendix A

Chapter 40, Resolves "Resolve relative to a new subway in the Dorchester District of the City of Boston." Appendix B

Chapter 96, Resolves "Resolve providing for an investigation by the Boston Transit Commission relative to the construction of an Elevated Railway Station near the corner of Charles and Leverett streets in the City of Boston." Appendix C

Chapter 158, Resolves "Resolve providing for a special commission to consider the financial condition of the Boston Elevated Railway Company." Appendix D

MISCELLANEOUS.

The Boston Elevated Railway Company has asked the Commission to investigate the cost, etc., of extending the platforms in the Washington street tunnel. The Chief Engineer has not yet reported thereon.

Certain residents of East Boston asked the Commission to remove the "hump," so-called, at the Maverick square terminus of the East Boston tunnel. The City Law Department reported that in its opinion the Commission had no authority to make such a change.

The Boston Elevated Railway Company definitely declined to take any action with reference to the provisions of Chapter 293, Special Acts of 1915 with relation to the removal of the elevated structure in Charlestown and the construction of a tunnel or subway in that district. In the opinion of the Commission, which opinion was endorsed by the City Law Department, without such action the Commission had no authority to carry out the provisions of the Act.

An application to the Supreme Court by a citizen of Charlestown for a writ of mandamus to compel the Commission to proceed under the Act, was denied by the Court.

EAST BOSTON TUNNEL.

Toll Receipts.

The following is a statement of the receipts from tolls and the cost of collection on the same for the year ending June 30, 1916:

July 1, 1915 to July 31, 1915:		
Receipts	$12,236 78	
Cost	1,877 53	
		$10,359 25
August 1, 1915 to October 31, 1915:		
Receipts	$40,589 66	
Cost	5,830 54	
		34,759 12
November 1, 1915 to January 31, 1916:		
Receipts	$43,736 81	
Cost	5,422 71	
		38,314 10
February 1, 1916 to February 7, 1916 inclusive:		
Receipts	$2,485 71	
Cost	433 07	
		2,052 64
		$85,485 11

On February 8, 1916, tolls abolished. (See Stats. 1915, Ch. 184, Special.)

SINKING FUNDS.

The following is the condition of the debt and of the sinking funds for the various divisions of the work of the Commission at the date of this report, as stated by the City Treasurer.

SUBWAY (INCLUDING ALTERATIONS.)

(Debt, $4,416,000, outside debt limit.)

Amount of fund, July 1, 1915		$1,701,601 95
Interest on bank deposits, July 1, 1915, to date	$1,315 82	
Interest on investments, July 1, 1915, to date	61,284 97	
Revenue, etc., July 1, 1915, to date	32,238 00	94,838 79
		$1,796,440 74

CHARLESTOWN BRIDGE, No. 1.

(Debt, $750,000, inside debt limit.)

Amount of fund, July 1, 1915		$249,492 03
Interest on bank deposits, July 1, 1915, to date	$1,484 93	
Interest on investments, July 1, 1915, to date	7,460 00	
Requirements for debt	7,656 00	16,600 93
		$266,092 96

CHARLESTOWN BRIDGE, No. 2.

(Debt, $805,000, outside debt limit.)

Amount of fund, July 1, 1915		$282,171 15
Interest on bank deposits, July 1, 1915, to date	$1,343 29	
Interest on investments, July 1, 1915, to date .	8,291 00	
Revenue, etc., July 1, 1915, to date	4,389 91	
Requirement for debt	5,613 00	19,637 20
		$301,808 35

EAST BOSTON TUNNEL.

(Debt, $3,268,000, outside debt limit.)

Amount of fund, July 1, 1915		$807,392 79
Interest on bank deposits, July 1, 1915, to date	$759 29	
Interest on investments, July 1, 1915, to date	27,740 89	
Revenue, etc., July 1, 1915, to date	119,263 65	147,763 83
		$955,156 62

BOSTON TUNNEL AND SUBWAY.

(Washington Street Tunnel.)

(Debt, $8,460,700, outside debt limit.)

Amount of fund, July 1, 1915		$907,443 60
Interest on bank deposits, July 1, 1915, to date	$773 26	
Interest on investments, July 1, 1915, to date..	34,204 47	
Revenue, etc., July 1, 1915, to date	56 152 95	91,130 68
		$998,574 28

RAPID TRANSIT—CAMBRIDGE CONNECTION.

(Debt, $1,465,000, outside debt limit.)

Amount of fund, July 1, 1915		$74,197 23
Interest on bank deposits, July 1, 1915, to date	$156 52	
Interest on investments, July 1, 1915, to date	2,684 41	
Revenue, etc., July 1, 1915, to date	14,936 27	17,777 20
		$91,974 43

BOYLSTON STREET SUBWAY.

(Formerly Riverbank Subway.)

(Debt, $5,005,000, outside debt limit.)

Amound of fund, July 1, 1915		$1,550 24
Interest on bank deposits, July 1, 1915, to date	$15 04	
Interest on investments, July 1, 1915, to date	35 00	50 04
		$1,600 28

DORCHESTER TUNNEL

(Debt, $8,634,000, outside debt limit.)

EAST BOSTON TUNNEL EXTENSION.

(Debt, $2,450,000, outside debt limit.)

RENTALS PAID BY THE BOSTON ELEVATED RAILWAY COMPANY.

The following is a statement of the bills rendered for rental of the various tunnels and subways and the amounts paid thereon:

Tremont Street Subway.

Sept. 30, 1915:		
Net cost of subway	$4,103,482 70	
One quarter's rental		$50,011 20
Alterations: net cost	212,673 93	
One quarter's rental		2,957 59
Dec. 31, 1915:		
Net cost of subway	4,103,482 70	
One quarter's rental		50,011 20
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
March 31, 1916:		
Net cost of subway	4,103,482 70	
One quarter's rental		50,011 20
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
June 30, 1916:		
Net cost of subway	4,103,482 70	
One quarter's rental		50,011 20
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
Total		$211,875 16

Washington Street Tunnel.

Sept. 30, 1915:		
Net cost of tunnel	$7,901,386 04	
One quarter's rental		$88,890 59
Dec. 31, 1915:		
Net cost of tunnel	7,901,699 78	
One quarter's rental		88,894 12
March 31, 1916:		
Net cost of tunnel	7,901,787 55	
One quarter's rental		88,895 11
June 30, 1916:		
Net cost of tunnel	7,901,215 24	
One quarter's rental		88,888 67
Total		$355,568 49

Cambridge Connection.

Sept. 30, 1915:		
Net cost of connection	$1,455,462 01	
One quarter's rental		$17,738 44
Dec. 31, 1915:		
Net cost of connection	1,456,057 04	
One quarter's rental		17,745 70
March 31, 1916:		
Net cost of connection	1,457,382 04	
One quarter's rental		17,761 84
June 30, 1916:		
Net cost of connection	1,457,382 04	
One quarter's rental		17,761 84
Total		$71,007 82

Boylston Street Subway.

Sept. 30, 1915:		
Net cost of subway	$4,588,181 21	
One quarter's rental		$51.617 04
Dec. 31, 1915:		
Net cost of subway	4,613,197 46	
One quarter's rental		51,898 47
March 31, 1916:		
Net cost of subway	4,613,323 24	
One quarter's rental		51,899 89
June 30, 1916:		
Net cost of subway	4,631,087 11	
One quarter's rental		52,099 73
Total		$207,515 13

East Boston Tunnel Extension.

March 31, 1916:		
Net cost of extension	$2,179,883 13	
*Rental for fourteen days		$3,762 54
June 30, 1916:		
Net cost of extension	2,187,221 99	
One quarter's rental		24,594 17
Total		$28,356 71

*Opened for use March 18, 1916.

STATEMENT OF EXPENSES.

The following is a classified statement of the expenses of the Commission for the year ending June 30, 1916:

EAST BOSTON TUNNEL.

ENGINEERING DEPARTMENT.

Office supplies	$4 00	
Skilled service	359 55	$363 55

SECTION B.

Construction	$851 05	
Field supplies	76 11	
Labor	3,472 53	
Office supplies	67 32	
Skilled service	817 50	
Teaming	59 31	5,343 82
		$5,707 37

SECTION F.

Credit:		
Construction		112 32
Balance		$5,595 05

BOSTON TUNNEL AND SUBWAY.

ENGINEERING DEPARTMENT.

Skilled service		$140 23
		$5,735 28

SECTION TWO.

Credit:		
Construction	$67 39	
Tools	50 00	117 39
Balance		$5,617 89

SECTION FOUR.

Skilled service		5 88
		$5,623 77

SECTION NINE.

Credit:		
Tools		50 00
Balance		$5,573 77

SECTION TEN.

Credit:		
Construction		44 93
		$5,528 84

CAMBRIDGE CONNECTION.

ENGINEERING DEPARTMENT.

Skilled service		39 71

SECTION TWO.

Construction	$187 00	
Damages	1,875 32	2,062 32
Carried forward		$7,630 87

Brought forward		$7,630 87
DORCHESTER TUNNEL.		
Office Expenses:		
Furniture	$9 10	
Lighting	64 48	
Printing	1,184 90	
Rental	3,251 00	
Stationery-supplies	628 54	
Telephone-telegraph	1,209 02	
Messenger	1,219 53	
Office Boy	10 83	
Stenographers	5,986 10	
Salaries of Commissioners and Secretary	28,500 00	
	$42,063 50	
Transferred to East Boston Tunnel Extension	$2,279 62	39,783 88
Engineering and Miscellaneous Expenses:		
Bethlehem Steel Co. (Contract 516)	$16,814 13	
Bethlehem Steel Co. (Contract 581)	5,060 42	
Advertising	145 50	
Borings-Material	5 00	
Chief Engineer	8,500 00	
Clerks	4,379 16	
Field supplies	1,462 21	
Fuel	236 00	
Inspection	222 72	
Instruments	45 10	
Labor	190 33	
Legal and expert advice	1,107 64	
Lighting	432 14	
Messengers	988 02	
Park Street enlargement	35,624 92	
Printing	1,562 16	
Rental	7,409 38	
Repairs	9 22	
Skilled service	79,038 58	
Stationery-supplies	2,677 90	
Stenographers	4,893 31	
Teaming	22 79	
Telephone-telegraph	476 04	
Testing	1,613 15	
Tools	520 33	
	$173,436 15	
Credit:		
Stock	4,369 42	169,066 73
SECTION A.		
(From the end of the Cambridge Connection at the east line of Tremont street, under Winter street to about the west line of Washington street.)		
Damages	$2,559 33	
Lighting	28 70	
	$2,588 03	
Credit:		
Coleman Bros. (Contract 468)	$500 00	2,088 03
Carried forward		$218,569 51

Brought forward		$218,569 51
SECTION B.		
(From about the west line of Washingtton and Summer streets to a point about 50 feet east of the east line of Arch street.)		
Hugh Nawn Contracting Co. (Contract 457) ..	$26,159 60	
Otis Elevator Co. (Contract 478)	1,995 00	
Penna. Tile and Construction Co. (Contract 529)	163 11	
DePaoli Mosaic Assn. (Contract 536)	474 07	
Northern Construction Co. (Contract 558) ...	14,189 90	
Advertising	1 10	
Alterations	164 11	
Construction	554 74	
Damages	4,048 05	
Field supplies	159 40	
Labor	574 50	
Legal and expert advice	200 00	
Lighting	296 41	
Paving	2,322 62	
Property Damages: Takings	39,535 34	
Skilled service	428 82	
Stationery-supplies	20 55	
Teaming	6 09	
Telephone-telegraph	13 69	
Testing	65 62	
Tools	13 82	
Water pipes	43 76	91,430 30
SECTION C.		
(Located in Summer street and extends from near Arch street to Dewey square, a distance of about 1,018 linear feet.)		
James J. Coughlan Co. (Contract 485)	$3,751 44	
Northern Construction Co. (Contract 558) ..	203 80	
Advertising	1 10	
Alterations	199 68	
Damages	1,913 40	
Field supplies	13 62	
Labor	185 17	
Paving	1,225 38	
Skilled service	429 83	
Stationery-supplies	16 40	
Teaming	16 57	
Telephone-telegraph	1 23	
	$7,957 62	
Credit:		
Construction $10 03		
Water pipes 4,308 12	4,318 15	3,639 47
SECTION D.		
(Located in Dewey square and Summer street and has a length of about 800 linear feet. It includes a two-platform station with a lobby over the tracks, a pump well, elevator shafts and stairways.)		
Hugh Nawn Contracting Co. (Contract 523) .	$258,966 66	
Otis Elevator Co. (Contract 546)	27,650 00	
Keith & Craffey (Contract 578)	4,564 25	
Carried forward	$291,180 91	$313,639 28

Brought forward	$291,180 91	$313,639 28
Galassi Mosaic & Tile Company (Contract 596)	6,029 61	
Keith & Craffey (Contract 594)	11,667 27	
Advertising	40 95	
Alterations	262 07	
Construction	37,842 11	
Damages	24 03	
Field supplies	1,547 63	
Fuel	38 40	
Inspection	316 26	
Instruments	20 84	
Labor	25,468 32	
Lighting	3,179 34	
Paving	223 83	
Rental	829 64	
Skilled service	5,145 82	
Stationery-supplies	230 51	
Teaming	324 03	
Telephone-telegraph	129 87	
Testing	28 40	
Tools	1,682 80	
Water pipes	969 83	387,173 47

SECTION E.

(Under and near the Fort Point Channel, from a point in Summer street about 200 feet west of the Channel to about 80 feet north of the corner of West Second street and Dorchester avenue, South Boston, and having a length of about 3,000 feet.)

P. McGovern & Co. (Contract 538)	$1,588,738 73	
Construction	133,225 15	
Field supplies	158 17	
Furniture	19 00	
Instruments	266 86	
Labor	9,976 68	
Legal and expert advice	436 00	
Lighting	565 65	
Skilled service	23,452 27	
Stationery-supplies	379 56	
Teaming	103 30	
Telephone-telegraph	74 04	
Testing	95 58	
Tools	391 51	
Water pipes	15 47	
		1,757,897 97

SECTION F.

(Broadway station, in Dorchester avenue between Broadway and Dover street.)

T. A. Gillespie Co. (Contract 599)	$40,370 25	
Advertising	138 70	
Alterations	14 85	
Borings: Labor	80 00	
Construction	11,965 98	
Field supplies	183 27	
Carried forward	$52,753 05	$2,458,710 72

Brought forward	$52,753 05	$2,458,710 72	
Fuel	8 80		
Inspection	90 10		
Instruments	8 00		
Labor	8,182 80		
Lighting	755 22		
Printing	251 50		
Rental	125 00		
Skilled service	1,828 53		
Stationery-supplies	56 09		
Teaming	44 25		
Telephone-telegraph	10 77		
Testing	4 00		
Tools	345 35	64,463 46	

SECTION G.

(In Dorchester avenue between West Fourth street and Old Colony avenue; about 1,280 feet long.)

Coleman Bros. (Contract 588)	$65,521 45	
Advertising	136 48	
Alterations	416 88	
Construction	19,145 36	
Field supplies	393 93	
Fuel	67 00	
Inspection	177 84	
Instruments	22 87	
Labor	7,368 36	
Legal and expert advice	88 00	
Lighting	243 76	
Printing	205 50	
Property Damages: Takings	9,143 99	
Skilled service	3,210 94	
Stationery-supplies	103 81	
Teaming	40 78	
Telephone-telegraph	28 77	
Tools	123 28	
Water pipes	29 69	106,468 69

SECTION H.

(In Dorchester avenue between Old Colony avenue and Woodward street, and having a length of about 2,200 feet.)

T. A. Gillespie Co. (Contract 550)	$514,864 07	
Alterations	1,673 66	
Construction	131,404 81	
Damages	400 00	
Field Supplies	772 59	
Fuel	45 20	
Inspection	520 69	
Instruments	11 80	
Labor	15,752 77	
Legal and expert advice	52 00	
Lighting	953 98	
Overflow sewer:		
Carried forward	$666,451 57	$2,629,642 87

Brought forward	$666,451 57	$2,629,642 87
Hugh Nawn Contracting Co. (Contract 568)	16,495 59	
Miscellaneous	726 65	
Paving	326 00	
Printing	12 50	
Skilled service	7,936 14	
Stationery-supplies	294 79	
Teaming	18 04	
Telephone-telegraph	92 58	
Testing	17 48	
Tools	236 34	
Water pipes	446 23	693,053 91

SECTION J. (Includes Andrew Square Station.)

(In and near Dorchester avenue and Boston street from about 80 feet north of Dexter street to about 30 feet south of Ralston street; about 1,000 feet in length.

Bethlehem Steel Co. (Contract 581)	$20,488 18	
T. A. Gillespie Co. (Contract 602)	17,608 10	
Advertising	234 05	
Alterations	323 16	
Construction	13,893 81	
Field supplies	135 19	
Fuel	18 88	
Inspection	96 07	
Instruments	1 13	
Labor	5,373 65	
Legal and expert advice	577 00	
Lighting	171 06	
Printing	156 00	
Skilled service	1,012 05	
Stationery-supplies	42 25	
Teaming	88	
Telephone-telegraph	7 50	
Tools	340 84	
	$60,479 80	
Credit:		
Property Damages: Takings	991 00	59,488 80

BOYLSTON STREET SUBWAY.

Engineering and Miscellaneous Expenses:		
Field supplies	$9 16	
Labor	17 25	
Legal and expert advice	750 00	
Printing	198 75	
Skilled service	3,401 64	
Stationery-supplies	16 50	
Stenographer	162 68	
Tools	1 00	
	$4,556 98	
Credit:		
Stock	2,673 65	1,883 33
Carried forward		$3,384,068 91

Brought forward		$3,384,068 91

SECTION ONE.

(From the easterly side of Kenmore street through Commonwealth avenue, the Fens, and Newbury street to the middle of Massachusetts avenue.)

Damages	$391 42	
Labor	99 80	
Legal and expert advice	300 00	
Property Damages: Takings	500 00	
Stationery-supplies	2 95	
	$1,294 17	
Credit:		
Construction	82 24	1,211 93

SECTION TWO.

(From the middle of Massachusetts avenue, under private property and Boylston street, to the easterly line of Hereford street.)

Hugh Nawn Contracting Company (Contract 427)	$1,707 70	
Galassi Mosaic & Tile Company (Contract 509)	252 74	
Alterations	7 05	
Construction	408 06	
Field supplies	34 19	
Fuel	9 20	
Instruments	3 12	
Labor	3,127 32	
Legal and expert advice	110 00	
Lighting	21 38	
Paving	13 99	
Property Damages: Takings	15,550 00	
Skilled service	767 67	
Stationery-supplies	32 92	
Teaming	63 12	
Tools	94 82	
Water pipes	21 21	22,244 49

SECTION THREE.

(From the easterly line of Hereford street, under Boylston street to the westerly end of the Public Library.)

Alterations	$16 24	
Damages	650 00	
Paving	38 03	
Skilled service	6 00	
	$710 27	
Credit:		
Construction	184 00	526 27
Carried forward		$3,408,051 60

Brought forward			$3,408,051 60

SECTION FOUR.

From the westerly end of the Public Library, under Boylston street, to about the center of Arlington street.)

Waldo Bros. Inc. (Contract 511)		$178 19	
Alterations		14 83	
Labor		48 42	
Legal and expert advice		312 12	
Lighting		6 38	
Paving		11 25	
Stationery-supplies		2 03	
Tools		81	
Water pipes		215 91	
		$789 94	
Credit:			
Hugh Nawn Contracting Company (Contract 453)	$141 37		
Construction	328 18	469 55	320 39

SECTION FIVE.

(*Located in Boylston street and extends from Arlington street to about 30 feet east of Carver street, a distance of about 1,050 feet.*)

Hugh Nawn Contracting Company (Contract 471)	$17,396 28	
Simpson Bros. (Contract 512)	172 38	
Hugh Nawn Contracting Company (Contract 562)	757 96	
Clark & Gore (Contract 569)	32,912 55	
Advertising	4 80	
Alterations	218 80	
Construction	189 79	
Damages	1,100 00	
Field supplies	28 39	
Labor	862 07	
Paving	3,551 69	
Skilled service	186 20	
Stationery-supplies	12 00	
Teaming	23 90	
Tools	13 28	
Water pipes	1,192 08	58,622 17

EAST BOSTON TUNNEL EXTENSION.

Office Expenses:		
Printing	$29 00	
Stationery-supplies	21 50	
Proportion of general expenses, transferred from Dorchester Tunnel	2,279 62	2,330 12
Carried forward		$3,469,324 28

Brought forward		$3,469,324 28
Engineering and Miscellaneous Expenses:		
Isaac Blair & Co. Inc. (Contract 448)	$10,715 86	
Air Duct	2,555 77	
Chief Engineer	500 00	
Clerks	518 01	
Field supplies	261 69	
Fuel	27 30	
Instruments	11 75	
Labor	100 42	
Legal and expert advice	261 53	
Lighting	1 50	
Messengers	16 74	
Printing	151 25	
Rental	291 66	
Skilled service	6,055 51	
Stationery-supplies	183 90	
Stenographers	506 23	
Telephone-telegraph	24 86	
Testing	5 60	
	$22,189 58	
Credit:		
Stock	788 47	21,401 11

SECTION G.

(*Changes in the Scollay square station and in the existing East Boston Tunnel and all new work from Washington street to Stoddard street.*)

Otis Elevator Company (Contract 545)	$20,180 00	
DePaoli Mosaic Assn. (Contract 553)	4,223 91	
Anderson & Letteney (Contract 561)	795 08	
Muir Bros. (Contract 566)	6,426 40	
Coleman Bros. (Contract 574)	123 40	
E. VanNoorden & Co. (Contract 575)	768 86	
Albert I. Berry (Contract 576)	1,365 70	
Waldo Bros. (Contract 587)	1,662 38	
Advertising	19 24	
Alterations	494 27	
Construction	23,693 67	
Damages	6,587 10	
Field supplies	2,113 12	
Fuel	40 48	
Instruments	16 70	
Labor	21,117 92	
Legal and expert advice	1,010 89	
Lighting	4,147 68	
Paving	862 58	
Property Damages: Takings	2,527 10	
Skilled service	1,960 40	
Stationery-supplies	166 39	
Teaming	575 60	
Telephone-telegraph	80 88	
Testing	112 60	
Tools	311 12	
Water pipes	271 65	101,655 12
Carried forward		$3,592,380 51

Brought forward		$3,592,380 51
SECTION H.		
(*All work from Stoddard street to Staniford street and including the Bowdoin station.*)		
Coleman Bros. (Contract 494)	$28,587 94	
Coleman Bros. (Contract 548)	171 03	
DePaoli Mosaic Assn. (Contract 552)	869 80	
Keith & Craffey (Contract 556)	1,781 14	
Anderson & Letteney (Contract 561)	397 54	
Albert I. Berry (Contract 567)	1,007 50	
Coleman Bros. (Contract 574)	17,099 01	
E. Van Noorden & Co. (Contract 575)	768 87	
Advertising	16 66	
Alterations	237 00	
Construction	6,008 85	
Damages	11,828 46	
Field supplies	249 14	
Fuel	2 00	
Instruments	1 30	
Labor	11,605 19	
Legal and expert advice	577 17	
Lighting	1,433 35	
Paving	1,860 00	
Property Damages: Takings	14,390 19	
Skilled service	1,022 44	
Stationery-supplies	81 34	
Teaming	110 87	
Testing	60	
Tools	77 19	
Water pipes	1,567 62	
	$101,752 20	
Credit:		
Telephone-telegraph	4 50	101,747 70
SECTION J.		
(*All work west of Staniford street to North Russell street.*)		
Alterations	$12 70	
Construction	147 32	
Field supplies	104 00	
Fuel	1 78	
Instruments	35 85	
Labor	1,819 92	
Legal and expert advice	25 00	
Lighting	28 54	
Paving	37 19	
Property Damages: Takings	6,200 00	
Skilled service	300 23	
Stationery-supplies	10 35	
Teaming	4 88	
Tools	54 71	
Water pipes	99	8,783 46
INTEREST.		
Dorchester tunnel	$241,013 75	
East Boston tunnel extension	96,660 00	337,673 75
Net increase		$4,040,585 42

SUMMARY.

SUMMARY.	From beginning of work to June 30, 1915	June 30, 1915 to June 30, 1916	Total.
Subway—Subway Commission	$14,131 16		$14,131 16
Part of General Expenses ...	117,550 71		117,550 71
Engineering and miscellaneous	407,475 48		407,475 48
Section One	239,407 12		239,407 12
Two	363,605 50		363,605 50
Three	300,639 36		300,639 36
Three and one-half .	9,355 70		9,355 70
Four	472,147 31		472,147 31
Five	388,955 49		388,955 49
Six	327,541 86		327,541 86
Seven	231,504 27		231,504 27
Eight	95,902 06		95,902 06
Eight and one-half	76,639 47		76,639 47
Nine	299,452 07		299,452 07
Ten	254,497 88		254,497 88
Eleven	270,310 57		270,310 57
Interest	258,575 60		258,575 60
	$4,127,691 61		$4,127,691 61
Transferred to Alterations, see 11th report	4 95		4 95
Total	$4,127,686 66		$4,127,686 66
Alterations—			
Part of general expenses ...	$28,945 53		$28,945 53
Section Three	2,568 26		2,568 26
Four	163 42		163 42
Five	30,233 01		30,233 01
Seven	178,516 16		178,516 16
Nine	3 00		3 00
Ten	534 04		534 04
Interest	1,905 56		1,905 56
Transfer from Subway, see 11th report	4 95		4 95
Total	$242,873 93		$242,873 93
Charlestown Bridge:			
Total	$1,570,197 98		$1,570,197 98
Investigation of Congestion of Traffic etc.:			
Total	$3,015 92		$3,015 92

	From beginning of work to June 30, 1915.	June 30, 1915. to June 30, 1916.	Total.
East Boston Tunnel—			
Part of General Expenses.	$161,134 78		$161,134 78
Engineering Expenses ..	193,072 92	$363 55	193,436 47
Section A	98,869 09		98,869 09
B	1,416,426 17	5,343 82	1,421,769 99
C	508,202 77		508,202 77
D	246,554 26		246,554 26
E	188,303 27		188,303 27
F	243,793 42	*112 32	243,681 10
Interest	248,156 88		248,156 88
Total	$3,304,513 56	$5,595 05	$3,310,108 61
Boston Tunnel & Subway—			
Part of General Expenses.	$226,486 57		$226,486 57
Engineering Expenses	418,340 29	$140 23	418,480 52
Section One	815,586 82		815,586 82
Two	641,723 64	*117 39	641,606 25
Three	683,832 90		683,832 90
Four	1,203,981 68	5 88	1,303,987 56
Five	1,080,023 84		1,080,023 84
Six	334,530 37		334,530 37
Seven	139,699 14		139,699 14
Eight	617,152 07		617,152 07
Nine	678,764 43	*50 00	678,714 43
Ten	142,880 35	*44 93	142,835 42
Eleven	345,493 91		345,493 91
Twelve	45,417 52		45,417 52
Interest	648,179 81		648,179 81
Total	$8,022,093 34	*$66 21	$8,022,027 13
Cambridge Connection—			
Office Expenses	$62,355 20		$62,355 20
Engineering Expenses	97,154 21	$39 71	97,193 92
Section One	588,772 24		588,772 24
Two	623,559 24	2,062 32	625,621 56
Interest	76,722 00		76,722 00
Total	$1,448,562 89	$2,102 03	$1,450,664 92
Dorchester Tunnel—			
Office Expenses	$66,477 87	$39,783 88	$106,261 75
Engineering Expenses	513,950 97	169,066 73	683,017 70
Section A	404,516 54	2,088 03	406,604 57
B	1,079,908 73	91,430 30	1,171,339 03
C	395,697 82	3,639 47	399,337 29
D	608,113 05	387,173 47	995,286 52
E	161,506 46	1,757,897 97	1,919,404 43
F	8 73	64,463 46	64,472 19
G.		106,468 69	106,468 69
H	59,994 73	693,053 91	753,048 64
J		59,488 80	59,488 80
Interest	179,419 98	241,013 75	420,433 73
Total	$3,469,594 88	$3,615,568 46	$7,085,163 34

*Decrease

	From beginning of work to June 30, 1915.	June 30, '15 to June 30, '16	Total.
Boylston Street Subway—			
Office Expenses	$71,105 17		$71,105 17
Engineering Expenses	174,037 10	$1,883 33	175,920 43
Section One	746,300 71	1,211 93	747,512 64
Two	929,348 23	22,244 49	951,592 72
Three	581,950 97	526 27	582,477 24
Four	1,436,957 87	320 39	1,437,278 26
Five	669,412 88	58,622 17	728,035 05
Interest	320,194 59		320,194 59
Total	$4,929,307 52	$84,808 58	$5,014,116 10
East Boston Tunnel Extension—			
Office Expenses	$31,309 18	$2,330 12	$33,639 30
Engineering Expenses	938,594 66	21,401 11	959,995 77
Section G	181,417 87	101,655 12	283,072 99
H	493,725 36	101,747 70	595,473 06
J	131,239 40	8,783 46	140,022 86
Interest	107,077 79	96,660 00	203,737 79
Total	$1,883,364 26	$332,577 51	$2,215,941 77
Chapter 84 — Resolves of 1913	$389 14		$389 14
Chapter 84 — Resolves of 1913	$636 58		$636 58
Dorchester Tunnel Extension	$520 19		$520 19
Grand Total	$29,002,756 85	$4,040,585 42	$33,043,342 27

The report of the Chief Engineer follows.

GEORGE F. SWAIN,
HORACE C. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

REPORT OF THE CHIEF ENGINEER.

BOSTON, June 30, 1916.

GEORGE F. SWAIN, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS, *Boston Transit Commissioners.*

GENTLEMEN:—I beg leave to submit the following report in regard to work done in connection with the construction of the Dorchester Tunnel, the Boylston Street Subway, and the East Boston Tunnel Extension, for the year ending June 30, 1916.

DORCHESTER TUNNEL.

In the last annual report the length of the Dorchester Tunnel was given as about 12,000 feet. The plans showing the final layout have since been made, by which it appears that the length of the tunnel measured on the center line of the track for southbound cars will be 11,894 feet and that the length measured on the center line of the track for northbound cars will be 11,928 feet. Descriptions of Sections A, B and C, which are completed and in operation, have been given in previous reports. The remaining sections are covered by this report.

Repaving of Summer Street Between Washington and South Streets.

During the summer of 1915 the surface of Summer Street, between Washington and South streets and of connecting streets where disturbed by tunnel construction, was permanently repaved under a contract with the Northern Construction Company. (See Appendix UU of Twenty-first Annual Report for canvass of bids.) In connection with this work the Boston Elevated Railway Company raised to grade and relaid the car tracks in Summer street and also track connections into Chauncy, Hawley, Kingston and High streets.

The street pavement previous to tunnel construction was of granite blocks laid on a concrete base between South and Hawley streets and of wood blocks on a concrete base between Hawley

and Washington streets. Under an arrangement with the Public Works Department of the City, by which the City paid the excess cost of so doing, the whole street between Washington and South streets was repaved with wood blocks on a concrete base. On account of the large amount of traffic, especially car traffic, on Summer street, it was necessary to do the greater part of the work at night, and in order to interfere as little as possible with the running of cars the tracks were relaid on Sundays. A roadway for teams was kept open, on one side of Summer street and also into intersecting streets, between the hours of 7:00 A. M. and 7:00 P. M. Car traffic, except on Sundays, was maintained during the same hours.

At the time when the Washington Station and a portion of the tunnel east of it was constructed, by the open cut method, the tracks for surface cars were supported on hard pine timbers, 12" square, placed longitudinally under each rail with vertical supports resting on the roof of the tunnel. These timbers were left in place until the backfilled earth had settled and the street could be repaved. The method of relaying the car tracks was as follows: The timbers beneath the rails were removed and the roadbed rolled with a heavy steam roller and graded to six inches below the grade of the bottom of the ties. Crushed stone was then placed in the roadbed and the new ties and rails laid. Cars were run on the new tracks for about three days, or until it was considered that the final settlement of the roadbed was reached. The tracks were then tamped up into place, the ballast below the ties was grouted, the concrete base was put in and the wood block pavement was laid.

Work was begun on June 19, 1915, and was completed on August 16, 1915. The total cost was $23,725.02, of which $9,331.32 was charged to the Public Works Department of the City for the excess cost of laying the wood block pavement where the granite block pavement was removed.

SECTION D.

Construction Data.

Location and description of structures: Section D is located in Dewey square and Summer street and extends from the westerly side of Dewey square to about 153 feet west of the intersection of Dorchester avenue and Summer street, a length of about 800 feet. It in-

cludes a two-platform station, about 357 feet in length, with lobby overhead.

Plates in this report: 2, 3 and 4.

Contractor for construction of steel and reinforced concrete structure and date of contract: Hugh Nawn Contracting Company, August 20, 1914.

Amount of bid: $673,780.00.

Date of beginning of work: August 25, 1914.

Date of completion named in contract: July 7, 1915.

Date of certificate of completion: November 19, 1915.

Amount of work done during the year ending June 30, 1916: Excavation, in open cut, about 4,798 cu. yds., in tunnel, about 6,377 cu. yds.; Old masonry removed, about 116 cu. yds.; Standard concrete placed, in open cut, about 2,392 cu. yds., in tunnel, about 2,546 cu. yds.; Cinder concrete placed, about 102 cu. yds.; Brick masonry placed, about 478 cu. yds.; Granolithic placed in station, about 3,817 sq. yds.; Steel rods used for reinforcing concrete, about 103 tons; Structural steel placed, about 134 tons; Long leaf pine lumber used for outside tunnel lining, about 209.8 M. ft. B. M.

Total amount of work done under the contract: Excavation, in open cut, about 62,998 cu. yds., in tunnel, about 15,658 cu. yds.; Old masonry removed, about 907 cu. yds.; Standard concrete placed, in open cut, about 11,742 cu. yds., in tunnel, about 5,184 cu. yds.; Cinder concrete placed, about 1,450 cu. yds.; Brick masonry placed, about 478 cu. yds.; Granolithic placed in station, about 3,817 sq. yds.; Steel rods used for reinforcing concrete, about 778 tons; Structural steel placed, about 1,103 tons; Steel sheet piling driven, about 140 tons; Long leaf pine lumber used for outside tunnel lining, about 209.8 M. ft. B. M.

Number of men ordinarily employed by the contractor for construction of steel and reinforced concrete structure during the progress of the work: Day, about 300; Night, about 180.

Character of earth found in excavation: Filling, soft mud, stiff blue clay and hard sandy clay.

Disposition of surplus earth: Teamed to scows and dumped at sea.

Contractor for building and erecting two double-file and two single-file escalators and date of contract: Otis Elevator Company, February 9, 1915.

Contract price for the four machines: $55,300.00.

Appendices in previous report and in this report showing bids: XXI., O and P; XXII., M, N, Q, U, V, Y, BB, EE and KK.

Assistant Engineer in charge of construction: G. D. Emerson.

Section D has been completed with the exception of a part of the interior finish of the station. The station at Dewey square, now called the South Station Under, was described in the last annual report.

HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION D, ONE OF THE SINGLE-TRACK TUBES, LOOKING TOWARD HEADING, SHOWING OUTSIDE WOODEN LINING, PILOT DRIFTS ABOVE SPRINGING LINE AND EARTH CORE.

PLATE 2

HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION D, ONE OF THE SINGLE-TRACK TUBES, LOOKING TOWARD SHAFT IN SUMMER STREET, SHOWING OUTSIDE WOODEN LINING, WATERPROOFING AND CONCRETE ARCH. WOODEN FORMS FOR CONCRETE HAVE NOT BEEN REMOVED.

On account of the troublesome character of the ground it was deemed advisable to change the type of the cross section for the easterly 160 feet of the tunnels included in this contract. Instead of a rectangular section with arched roof a complete circular section was substituted, with an outside wooden shell, 9 inches thick, and an inside concrete lining with a minimum thickness of 2 feet. A waterproofing membrane was placed between the wood and the concrete. This type of section is similar to that used in the tunnels under the channel (Section E), except that the Section D tunnels were constructed by drifting instead of with shields and in free air instead of under compressed air. Plates 2 and 3 show construction work for the arch in the northerly tunnel.

On account of the proximity of the "South Station Under" to Fort Point Channel, under which the tunnel has to pass, the station had to be at a great depth, and for this reason it is a double deck structure, the platforms being about 43 feet below the surface of the street and the ticket office lobby about 30 feet below the surface of the street at Dewey square.

The upper story is constructed for the full length and width of the station. At the easterly end of the upper level about 135 linear feet has been partitioned off and is being equipped by the Boston Elevated Railway Company for use as a transformer room. The ticket office lobby occupies the central portion of the upper story and is about 116 feet in length From this lobby there are two single-file cleat type reversible escalators, placed side by side, leading to Summer street, in front of the South Terminal Railway Station. A wide ramp, inclined at a grade of eleven and one-half per cent., leads up from the westerly end of the lobby, and over the westerly end of the station it branches into two passageways which terminate in short flights of stairs reaching the surface in the sidewalks of Atlantic avenue and of Summer street at the westerly end of Dewey square. At the easterly end of the lobby is a broad stairway up to a landing from which passageways and stairs lead to the north and to the south sides of Summer street in front of the South Terminal Railway Station, making in all four stairways which reach the surface, one at practically each corner of Atlantic avenue and Summer street. These stairways are protected at the street level by the same type of coverings, with polished walls and concrete roof over about one-half of the opening, as shown on Plate 15 and similar to those described for

the East Boston Tunnel Extension. The escalators are sheltered by coverings constructed of the same materials and of the same design as the building at Scollay square, which is also shown on Plate 15.

The lower level of the station, for trains, has two side platforms, each about 357 feet long and 15 feet wide, with additional width at the foot of the stairways and escalators. (See Plate 4.) Between the lobby and each platform are three stairways, two of which are eight feet wide and one eleven feet wide. In addition, a double-file escalator of the cleat type leads from each platform directly to the surface of the street. The one from the southerly platform reaches the surface at the side of the South Terminal Railway Station on the easterly side of Atlantic avenue, and the one from the northerly platform reaches the surface a little west of the northwest corner of Atlantic avenue and Summer street.

Station Finish, South Station Under.

In December, 1915, when the construction contract of the station was nearing completion, the work of station finish was begun, and at the date of this report it is, with a few minor exceptions, practically completed.

The construction contract included the casing of the steel columns with cement and the laying of the granolithic floors, but the remaining work of transforming the rough concrete structure into the finished station has, in accordance with the custom of the Commission, been let in various contracts to experts in each of the various branches of the work. These additional contracts were for setting ribbed tile, white cement plastering, terrazzo and tile work, copper covered doors, hand-rails, iron fences, escalators and grilles. Various miscellaneous items of concrete work, including the construction of the stairs and the coverings over the stairway and escalator openings at the surface, have been done by skilled laborers from the Commission's force and from the various subway contractors.

The type of finish of the walls and ceilings of the South Station Under is similar to that of the Washington Station of the Dorchester Tunnel and to the stations of the Cambridge Subway. The distinguishing color of this station is blue. The floors and columns, and the sanitary base to a height of fifteen inches above the floors, are of darkened cement. The wainscot, 6′ 3″ high above the base in the lobby and 4′ 10″ elsewhere, is of white ter-

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DORCHESTER TUNNEL, SECTION D, "SOUTH STATION UNDER," NORTHERLY PLATFORM, LOOKING EASTERLY.

PLATE 4

razzo with borders at the top and bottom of blue and white tile. The remainder of the walls and ceilings are finished with white Portland cement plaster. The doors are of pine covered with copper. The handrails are of oak, supported by solid bronze brackets and cast iron posts. Center handrails are installed whenever the space between rails is more than four feet. The stairs are of concrete with cast iron base plates and safety treads attached, premoulded at the stockyard of the Commission, as described on page 49. The use of these premoulded stairway units has resulted in stairs which are true to dimensions.

The principal contracts for station finish at the South Station Under are as follows:

Lavers Granite Co.,	Polished granite sides of coverings over stairways.
Keith & Craffey,	Ribbed tile.
Keith & Craffey,	White cement plaster.
Galassi Mosaic & Tile Co.,	Wall finish, terrazzo and tile.
W. A. Murtfeldt Co.,	Copper covered doors.
O. H. Drisko & Son,	Oak handrails.
W. A. Snow Iron Works, Inc.,	Iron fences and gates.

SECTION E.

Construction Data.

Location and description of structures: Section E and its extension includes two single track tunnels, beginning near the intersection of Summer street and Dorchester avenue and extending under Fort Point Channel, private property and streets, to a point in Dorchester avenue near its intersection with the northerly line of Broadway, South Boston, a distance of about 3,500 feet.

Plates in previous report and in this report XXI., 2 and 3; XXII., 5, 6, 7, 8 and 9.

Contractor and date of contract: P. McGovern & Company, December 16, 1914.

Amount of bid for about 3,200 linear feet, not including Section E extension: $1,955,375.00.

Date of beginning of work: Work started on main shaft in West First street, January 6, 1915.

Date of completion named in contract: October 1, 1916.

Amount of work done during the year ending June 30, 1916: Excavation, by shield method, about 100,298 cu. yds., in drift tunnels, about 10,294 cu. yds.; Concrete placed, in shield tunnels, about 30,585 u. yds., in drift tunnels, about 3,857 cu. yds.; Long leaf pine lumber used for outside tunnel lining, about 3,829 M. ft. B. M.

Total amount of work done from beginning of work to and including

June 30, 1916: Excavation, by shield method, about 104,882 cu. yds., in shaft and drift tunnels, about 21,794 cu. yds.; Concrete placed, in shield tunnels, about 31,469 cu. yds., in shaft and drift tunnels, about 5,804 cu. yds.; Long leaf pine lumber used for outside tunnel lining, about 3,995 M. ft. B. M.

Number of men ordinarily employed by the contractor during the year ending June 30, 1916: First (day) shift, about 340; Second (evening) shift, about 180; Third (night) shift, about 180.

Character of earth found in excavation: In general, medium stiff blue clay at upper portion of tunnel section. Hard mixture of sand, clay and boulders at lower portion of tunnel section. Ledge of rock extending up into the tunnel section to 10 feet from the bottom for a length of about 220 feet. Some sand pockets a short distance south of the Summer street bridge.

Disposition of surplus earth: Delivered to scows and used by sub-contractor for filling East Boston flats.

Appendix in previous report showing bids: XXI., BB.

Assistant Engineer in charge of construction: G. D. Emerson.

Some features of the design and construction of Section E which were given in the last annual report are repeated in the following description for the sake of completeness.

The tunnels are of two types. Between Summer street and West First street they are circular in section and are being driven by the shield method under compressed air. The length of this part of the line is about 3,060 feet, of which 2,160 feet is under Fort Point Channel. Between West First street and Dorchester avenue at Broadway, a distance of 370 feet, the tunnels are rectangular in section with arched roofs and are being driven by drift methods, most of the time under compressed air. Work on all four tunnels has been prosecuted from a main shaft located in West First street. The shaft is rectangular, 64 feet x 70 feet, and its bottom is about 60 feet below the surface of the street. The earth was mostly blue clay, and its excavation in the shaft and far enough in the tunnels to install the air locks, was successfully done in free air, although very heavy bracing was necessary in the shaft to withstand the earth pressures which developed before the reinforced concrete lining could be placed.

The two shields, which were built for the contractor by the Boston Bridge Works, were teamed to and lowered into the shaft in sections and were riveted up on timber cradles resting on the bottom. The shields are 24 feet 4½ inches in diameter, 12½ feet long, and each weighs about 83 tons without the jacks. Each shield is equipped with twenty-four 8-inch hydraulic jacks with

a 34-inch stroke. The forward ends of the shield decks are fitted with sliding extension platforms. The platform of each deck is divided into two sections, each section being forced out by two 3½-inch hydraulic jacks. All the jacks work under a maximum hydraulic pressure of 5,000 pounds per square inch. The main jack heads are shaped so that they form a nearly continuous ring of the same diameter and thickness as the outer wooden lining, against which they react when shoving the shield forward. The platform rams keep the extension platforms pressed against the earth at the working face, thus providing necessary support in keeping sandy soil from caving in and preventing excessive flow of the clay.

The outer shell of each tunnel is made of Southern long leaf pine, 9 inches thick and 24 feet 2 inches external diameter. It is built up of segments accurately sawed to shape, each segment being about 4 feet 8 inches long, 9¾ inches wide, and of the same thickness as the completed lining (9 inches), 16 segments and a short key completing each ring. The segments are assembled in the tail of the shield as fast as it is pushed ahead. The segments of each ring are fastened to those of the preceding one already in place by means of ½-inch steel pins. The pins are inserted in holes drilled in the segments before erection, and then when each segment is in place, are forced into the ring behind by means of the shield jacks.

Before placing the concrete lining a waterproofing membrane is applied to the interior surface of the wooden shell. This membrane consists of three layers of an asphalt saturated cotton fabric mopped with hot asphalt. In applying the waterproofing the first layer of cloth is mopped with hot asphalt on one side and then nailed to the wood, the mopped side being next to the wood. The second and third layers are then stuck on with successive moppings of hot asphalt.

The concrete lining has a standard minimum thickness of 2 feet and in general is not reinforced. Some reinforcement was used on the westerly side of the arch of the easterly tube in order to take care of the temporary stresses resulting from the passage of the shield of the westerly tunnel, which was usually a few hundred feet behind the heading of the easterly one. The horizontal displacement of the easterly tunnel, due to the driving of the westerly one alongside of it, with about 5 feet clearance between them, was about ⅜ of an inch.

A belt conveyor about 110 feet long is attached to the rear of each shield and is pulled along as the shield advances. It runs on one of the two narrow gauge working tracks which are laid on the invert of the tunnel as fast as the latter is put in place. The belt conveyors serve to convey the excavated earth past the points where the operations of placing the wooden lining, waterproofing, invert concrete and grouting outside the wooden lining are going on and so avoid interference with them. The earth is discharged from the conveyors into muck cars, which are pushed, one at a time, under the discharge chutes about 100 feet in the rear of the shields. All the hauling of construction materials and of excavated earth through the tunnels is done by small electric locomotives operated by storage batteries. Plate 5 shows one of these locomotives hauling a train of muck cars out from one of the air locks.

Concrete is brought into the tunnels in steel cars containing about one cubic yard and is hoisted by means of elevators to overhead platforms before being shoveled into the forms. There are two of these concrete elevators at the heading of each tunnel. The forward ones for invert concrete are just behind the shields and hoist concrete cars from the construction tracks alongside the belt conveyors. The rear ones which are used for arch concrete are just behind the belt conveyors and hoist the concrete cars from the same track that the conveyors run on.

Plate 6 shows the relative positions of these various parts of the working plant.

The elevators and overhead platforms span the construction tracks and the belt conveyor, and travel on two rails which are supported on the lower concrete duct line benches along the sides of the tunnel as indicated on the cross sections on Plate 6.

Blaw steel forms are used for placing the concrete in the walls and arches. These forms are made up in 5-foot panels. Three of the panels (15 feet of forms) are handled as a unit by means of a steel traveler which runs on the same rails as the concrete elevators and overhead platforms. The forms are made collapsible so that a panel at the rear can be lowered on to the traveler and moved ahead under the forms still in place and set up in its new position just ahead of the completed arch. (See Plate 7.)

The sequence of the various steps in the construction of the tunnel is as follows:

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DORCHESTER TUNNEL, SECTION E, STORAGE-BATTERY LOCOMOTIVE HAULING TRAIN OF MUCK CARS FROM ONE OF THE AIR LOCKS.

PLATE 5

HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION E, LOOKING TOWARD HEADING OF ONE OF THE TUBES, SHOWING BELT-CONVEYOR FOR EARTH, COLLAPSIBLE STEEL FORMS FOR CONCRETE AND TRAVELER FOR SHIFTING STEEL FORMS.

PLATE 7

(1) Excavating ahead of the shield about 20 inches.
(2) Shoving the shield ahead about 20 inches.
(3) Assembling two rings of the wooden lining in the tail of the shield.
(4) Waterproofing the invert. (Ordinarily done in 15-foot lengths.)
(5) Concreting the invert. (Ordinarily done in 15-foot lengths.)
(6) Grouting outside the wooden lining. (Carried on at the same time as 4 and 5.)
(7) Waterproofing the walls and arch.
(8) Concreting the walls and arch. (Ordinarily done in 15-foot lengths.)
(9) Grouting any spaces left between the waterproofing and the concrete at the top of the arch.

Three air locks are set in the bulkhead of each of the channel tunnels. The two lower locks, used for taking materials in and out, are each 50 feet long and 7½ feet in diameter. The upper lock, used by the workmen, is 30 feet long and 6 feet in diameter.

The cars carrying the earth out of the tunnels are hoisted up the shaft on elevators to an overhead trestle above the street. Here they are dumped into larger cars, which are hauled over a trestle several hundred feet by means of a dinkey engine to the edge of the channel, where the earth is dumped into scows.

Plate 8 shows a geological profile of the ground through which the tunnels were driven. The shale ledge which was encountered, as indicated on the profile, varied from quite soft to medium hard material. Most of it required blasting for its removal.

The easterly and westerly shields were driven 180 and 105 feet respectively from the shaft in free air before the excessive flow of the blue clay made it necessary to install the air locks and put the headings under compressed air. The maximum range of air pressures used varied from 12 to 28 pounds gauge per square inch. For the greater portion of the distance the air pressure was kept between 18 and 22 pounds gauge per square inch. For a short time when the easterly tube was about 300 to 400 feet south of the Summer street bridge it was necessary to raise the pressure to between 26 and 28 pounds in order to drive through some water-bearing sand pockets. The water encountered at this point was fresh and under a higher head than that of the channel above. On

this account it was impossible to hold the air in the tunnel at a pressure sufficiently high to dry out the sand, as the earth overhead was too thin to resist the pressure, and excessive blowouts resulted. The difficulties at this point were finally overcome by depositing a clay blanket on the bottom of the channel over the heading, to help in holding the compressed air, and by completely timbering the face of the heading at the front of the shield and working the boards ahead one at a time. Plate 9 shows the air escaping at site of the old Mt. Washington avenue bridge, probably through a small hole where a pile was withdrawn. Plate 10 shows a portion of the contractor's power plant.

The shield for the easterly tube was started May 8, 1915, and was stopped from June 12 to June 29, 1915, while the air locks were being installed; also from July 28 to August 23, 1915, while the belt conveyor was being installed. The shield for the westerly tunnel was started June 15, 1915, and was stopped from June 26 to July 30, 1915, while the air locks were being installed, and from September 27 to November 7, 1915, while the position of the air locks was being changed and the belt conveyor was being installed. On June 3, 1916, the shield of the easterly tunnel was driven through to Section D, the end of the tunnel already completed in Summer street, and after removing all of the shield except its shell, the concrete arch was finished on June 27, 1916. At the date of this report the shield of the westerly tunnel is within 50 feet of the completed work in Summer street.

Working three 8-hour shifts per 24 hours the progress which has been attained for various times is as follows:

Maximum 24 hour run for one shield—19 feet.
Maximum 7 day run for one shield—105 feet, or 15 feet per day.
Maximum 30 day run for one shield—400 feet, or 13½ feet per day.
Maximum 3 months run for one shield—375 feet per month, or 12½ feet per day.

The sustained progress over a period of 8 or 9 months, including all shut downs and delays for holidays, repairs, etc., was at the rate of 9.3 feet per day for the easterly tunnel and 10.8 feet per day for the westerly tunnel. The above figures are for completed tunnel, including the concrete lining.

It is probable that a sustained progress of about 15 feet per day could be maintained with the tunnels entirely in blue clay.

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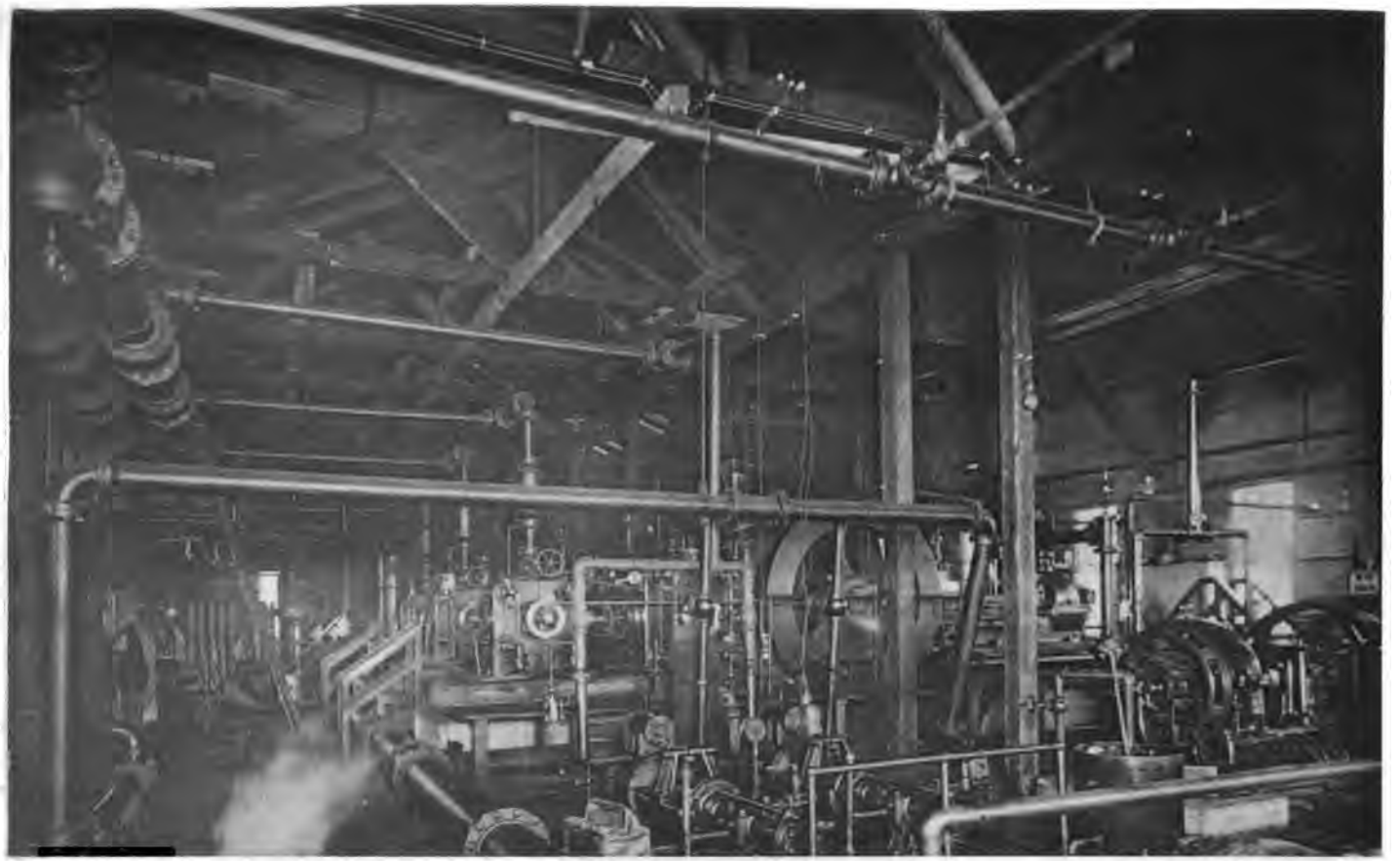
DORCHESTER TUNNEL, SECTION E, SHOWING COMPRESSED AIR ESCAPING IN FORT POINT CHANNEL FROM HEADING OF TUNNEL EXCAVATION, DECEMBER 20, 1915.

PLATE 9



HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION E, PART OF CONTRACTOR'S PLANT FOR THE COMPRESSED-AIR TUNNELS UNDER FORT POINT CHANNEL, SHOWING AIR-COMPRESSORS, ELECTRIC GENERATORS, HIGH-PRESSURE HYDRAULIC PUMPS, ETC.

Experience on this work indicates that the following rule for the time taken by the men to decompress from the pressure in the tunnel to normal atmospheric pressure gives reasonably satisfactory results:

For pressures up to 12 pounds gauge—no time limit necessary.

For pressures from 12 to 28 pounds gauge—one minute for each pound that the gauge pressure in the tunnel exceeds 12 pounds.

An occasional man, even when passed by competent medical examination, seems to have an individual susceptibility to some form of compressed air disease, and no practicable rule for decompression would probably entirely eliminate trouble from this cause.

Drift Tunnels.

In the original contract two drift tunnels were to be driven south from the shaft about 70 feet, working in free air. It was soon discovered, however, that the blue clay through which the tunnels were being driven flowed so readily that it was impracticable to complete them without a settlement of the surface which would result in considerable injury to overhead buildings, etc. An extension of the original contract was then arranged, under which these tunnels were to be driven about 300 feet further south; the uncompleted portion of the original contract and all of the extension work to be done under compressed air. The northerly third of the building at the corner of West Second street and Dorchester avenue, which had settled somewhat on account of the attempt to tunnel near it in free air, was temporarily supported on concrete cylinders sunk to the depth of the bottom of the tunnel. After this had been done the tunnels, with the aid of compressed air, were successfully driven under buildings from 2 to 4 stories in height without any serious settlement or injuries to the buildings. The ground was largely stiff blue clay. At the date of this report the tunnels are completed to within a few feet of the end of the contract section.

SECTION F.

Construction Data.

Location and description of structures: Section F is located in Dorchester avenue, South Boston, and extends from near the northerly

side of Broadway to a point about 60 feet south of the southerly line of West Fourth street. It includes a two-story underground station, the lower level to be used by tunnel trains and the upper level by surface cars (transfers from one level to the other are provided for by stairways connecting the two levels); also a surface car incline running out to the surface in Foundry street and an underground loop at the northerly end of the station, so that northbound surface cars can be looped back through the station without going to the surface.

Plate in this report: 16.

Contractor for construction of steel and reinforced concrete structure and date of contract: The T. A. Gillespie Company, March 8, 1916.

Amount of bid: $363,744.50.

Date of beginning of work: April 3, 1916.

Date of completion named in contract: January 31, 1917.

Amount of work done to and including June 30, 1916: Excavation, about 16,300 cu. yds.; Standard concrete placed, about 2,230 cu. yds.; Steel rods used for reinforcing concrete, about 99 tons.

Number of men ordinarily employed by the contractor for construction of steel and reinforced concrete structure from beginning of work to and including June 30, 1916. Day, about 190; Night, about 90.

Character of earth found in excavation: Filling, yellow clay and blue clay.

Disposition of surplus earth: Hauled to various vacant lots and used for filling.

Appendices in this report showing bids: T, AA and GG.

Assistant Engineer in charge of construction: G. D. Emerson.

Section F is being constructed entirely in open cut. By arrangement with the Boston Elevated Railway Company the street cars have been temporarily diverted from Dorchester avenue between Broadway and West Fourth street. This will greatly facilitate the progress of the work, particularly as the grade of the surface of Dorchester avenue in this zone is to be raised from its present elevation at Broadway to a maximum of about 4 feet above its present elevation at West Fourth street. The grade of West Fourth street will also have to be changed for a distance of about 150 feet either side of Dorchester avenue, to meet the new grade at their intersection. These grade changes were made necessary in order that the surface car incline tracks might be brought to the surface without closing either West Fourth street or A street.

With the consent of the tenants of the buildings affected, the portion of Dorchester avenue between Silver street and West Fourth street has been entirely closed to vehicular traffic until

near the completion of the work. Omitting the usual timber bridging of the street will considerably shorten the time necessary to complete this part of the work and consequently the time during which the adjacent tenants will be discommoded on account of it.

The Contractor's method of carrying on the work has been to first support the street fronts of the buildings on steel needle beams, and then excavate for and put in sections of the concrete sidewalls for the tunnel station. On account of the light weight of most of the buildings and the favorable character of the ground it has not been found necessary (with one exception) to extend the building foundations down to the bottom of the tunnel structure. After each section of sidewall was in place, the load of the adjacent building was transferred back on to the ground at about the original foundation level, any slight settlement of the ground caused by the tunnel excavation being taken up by wedging.

After a sufficient length of sidewalls are in place, the earth core in the center of the street will be excavated and the invert, middle floor and roof put in.

At the date of this report about 20 per cent. of the contract has been done.

SECTION G.

Construction Data.

Location and description of structures: Section G is a two-track structure of reinforced concrete, and extends along Dorchester avenue from a point about 60 feet south of the southerly line of West Fourth street to Section H at Old Colony avenue, a length of 1,280 feet. It includes an open incline for surface cars.

Plates in this report: 11 and 16.

Contractor for construction of steel and reinforced concrete structure and date of contract: Coleman Brothers, November 12, 1915.

Amount of bid: $382,364.00.

Date of beginning of work: November 29, 1915.

Date of completion named in contract: December 31, 1916.

Amount of work done from beginning of work to and including June 30, 1916: Excavation, about 24,000 cu. yds.; Concrete placed, about 3,300 cu. yds.; Steel rods used for reinforcing concrete, about 202 tons.

Number of men ordinarily employed by the contractor for construction of steel and reinforced concrete structure from beginning of work to and including June 30, 1916: Day, about 78; Night, about 23.

Character of earth found in excavation: For a depth of about twenty feet, the earth consists of fine sand mixed with yellow clay and contains a small amount of water. Below this is soft blue clay for the remaining depth.

Disposition of surplus earth: Taken in cars and teams to fill in an arm of the South Bay near the work
Appendices in this report showing bids: O, S and T.
Assistant Engineer in charge of construction: Wilbur W. Davis.

Two alternate designs were made for the construction of Section G, one for the open cut method of construction and the other for the tunnel method of construction, the choice between the two methods to be left to the contractor. As the amount of earth to be excavated and the amount of concrete to be placed by the two methods was not the same, bids per linear foot of tunnel excavation and per linear foot of concrete to be placed were asked for.

The Contractor has adopted the open cut method for construction.

Dorchester avenue, between West Fourth street and West Fifth street, has been widened from about 60 feet to a width of about 108 feet to provide for an open incline for surface cars to enter the underground station for surface cars which is now being constructed as a part of Section F, above the main tunnel station. Land was taken on the easterly side of the avenue August 19, 1915, for the widening, and later the buildings on the property were removed by William G. Greene & Sons, contractors. The open incline is located in the middle of the avenue, parallel to, partly over and partly to the east of, the main tunnel. At its northerly end, where it gets below the surface near West Fourth street, it curves to the west over the main tunnel.

Along Dorchester avenue, between West Sixth street and Old Colony avenue, for a length of about 600 feet, it is necessary to replace the existing intercepting sewer by a new one nearly parallel with and east of the tunnel location, as the present sewer is within the space to be used for the tunnel. As this sewer during heavy storms flows to its full capacity and is subject to considerable head it was decided to construct the new sewer and abandon the old one before beginning construction of the tunnel at this place. About 420 linear feet of the total length of this new sewer is now completed, of which about 318 linear feet was built in a tunnel excavated for it. About 100 feet south of West Sixth street the tracks of the New York, New Haven & Hartford Railroad cross diagonally under Dorchester avenue. The tunnel and sewer will be built at such depth as to pass under the railroad. It is necessary to construct a siphon in the sewer at this railroad cross-

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DORCHESTER TUNNEL, LOOKING SOUTHERLY FROM WEST FOURTH STREET, SHOWING PART OF SECTIONS F AND G, WITH STREET WIDENING FOR SURFACE CAR INCLINE LEADING DOWN TO THE UPPER LEVEL OF BROADWAY STATION.

PLATE 11

ing. Anticipating the widening of the railroad cut to accommodate four tracks this siphon is being built about 160 feet in length. The siphon consists of two cast iron pipes, side by side, surrounded by reinforced concrete. One pipe is 48" in diameter and the other is 24" in diameter. The contractor for the work, in co-operation with the New York, New Haven & Hartford Railroad Company, decided to confine the railroad trains in both directions to one track and to carry the track on suitable steel beams supported on piles driven to a depth below the elevation for the bottom of the tunnel, during construction of the sewer and tunnel at this place. The piles have been driven about 9 feet below the grade for the bottom of the tunnel and are now ready for capping.

At B street a brick sewer, 5 feet x 6 feet 6 inches in section, is connected through a 20" inlet with the intercepting sewer. The overflow provided for this sewer into the South Bay will require a tidegate chamber over the roof of the tunnel. South of this B street overflow the intercepting sewer is egg-shaped, 5 feet 6 inches x 4 feet 9 inches in cross section, and north of the overflow, except at the siphon and at the tunnel crossing, the intercepting sewer is elliptical, 3 feet x 5 feet in cross section. It is built of reinforced concrete lined with brick.

Section G also includes a ventilation chamber at B street and a pump well at West Fifth street.

Work on Section G, except for the intercepting sewer and the pump well, was begun at the northerly end. To date, about 260 feet have been excavated to grade, or to about 43 feet below the surface of the street. Construction of the concrete tunnel in the respective stages follows closely after the excavation.

Method of Construction.

The construction is being carried on by the open cut method. The contractor is not required to bridge over the surface of the street, as all traffic, including the street cars, has been temporarily diverted from this section of Dorchester avenue. (See Plate 11.) The excavation is done by driving two sets of wooden sheeting on each side of the line of the tunnel, excavation for the entire width being made as driving proceeds. The upper set of sheeting is two inches thick and about eighteen feet long. The second set, offset about 12 inches from the first, is 3-inch tongue and groove sheet piling about twenty-six feet long, driven a little below the grade

of the bottom of the tunnel. The sheet piling is driven by a pile driver operated by compressed air. The excavation is braced across by 12-inch square hard pine timbers, spaced about ten feet apart horizontally and about five feet apart vertically. The earth is hoisted to the surface in buckets by derricks and is dumped into small steel cars which run on a track close to and parallel to the line of excavation and conveyed to the flats adjacent to the South Bay near the work.

The concrete for the invert is placed in sections about forty feet long, and for the entire width of the tunnel, in one operation. The sidewalls of the single arch section, the only sidewalls built to date, are built to the springing line in two operations, as it is considered unsafe to remove more than one set of braces at one time. The arch above the springing line is built in one operation in sections about twenty feet long. The forms for the concrete are patent steel covered panels, 3 feet x 2 feet, supported by steel ribs. The panels may be removed, leaving the ribs in place.

SECTION H.

Construction Data.

Location and description of structures: Section H and its extension is a two-track structure of reinforced concrete, and extends along Dorchester avenue between Old Colony avenue and a point about 80 feet north of Dexter street, a distance of about 2,640 feet. (On September 16, 1915, the contract was extended from Woodward street to a point about 80 feet north of Dexter street, a distance of about 430 feet.)

Plates in this report: 12 and 13.

Contractor for construction of reinforced concrete structure and date of contract: The T. A. Gillespie Company, March 4, 1915.

Amount of bid for about 2,210 linear feet, not including extension: $554,750.00.

Date of beginning of work: April 5, 1915.

Date of completion named in contract: June 30, 1916.

Date of certificate of completion: June 20, 1916.

Total amount of work done to and including June 30, 1916, from beginning of work: Excavation, about 105,668 cu. yds.; Standard concrete placed, about 28,482 cu. yds.; Structural steel placed, about 64 tons; Steel rods used for reinforcing concrete, about 1,703 tons.

Number of men ordinarily employed by the contractor for construction of reinforced concrete structure during the progress of the work: Day, about 170; Night, about 100.

Character of earth found in excavation: Sand, gravel and clay in varying proportions.

HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION H, SHOWING INVERT CONSTRUCTION, SOME OF THE REINFORCING RODS IN PLACE.

PLATE 12

HELIOTYPE CO. BOSTON

DORCHESTER TUNNEL, SECTION H, SHOWING SIDEWALL AND ROOF CONSTRUCTION, STEEL FORMS FOR CONCRETE HAVE NOT BEEN REMOVED.

PLATE 13

Disposition of surplus earth: Teamed to flats near the work.
Appendices in previous report and in this report showing bids: XXI., OO and SS; XXII., F.
Assistant Engineer in charge of construction: Robert B. Farwell.

The general method of excavating on this section was described in the last annual report. As the excavation at each place was finished the concrete invert was put in place. The sidewalls were then built on each side in 40 foot lengths, after which the roof was put in in sections of the same length. Steel forms were used most of the way on both sidewalls and roof. (See Plates 12 and 13.) In connection with the work new sewers were built on each side of the tunnel.

The work during the winter and spring was mostly on the extended portion of the contract southerly from Woodward street. The fronts of the buildings on the westerly side of Dorchester avenue were supported over the excavation and pinned off on the structure after it was built. Excavation for the entire width was done in one operation. Good progress was made although the winter was severe. The street has been backfilled and paved temporarily with granite blocks.

The work on this section included an emergency exit near the plant of the Hunt-Spiller Manufacturing Corporation, a pump well and emergency exit at D street, and a ventilating chamber and an emergency exit near Woodward street. On account of necessary changes in sewers which interfered with the construction of the tunnel a contract was let July 8, 1915, to the Hugh Nawn Contracting Company for the construction of a new overflow sewer from D and Damrell streets to the South Bay. The sewer was built of reinforced concrete and was 7′ 6″ x 8′ 5″ in size. A pile foundation was required. The work was begun July 13 and was finished October 11, 1915. (See Appendix F for canvass of bids.)

SECTION J.

Construction Data.

Location and description of structures: Section J is a two-track structure of reinforced concrete and structural steel and extends from about 80 feet north of Dexter street to about 30 feet south of Ralston street, a length of about 985 feet. It includes the Andrew Square Station.
Plate in this report: 17.

Contractor for construction of steel and reinforced concrete structure and date of contract: The T. A. Gillespie Company, April 17, 1916.
Amount of bid: $346,887.50.
Date of beginning of work: April 20, 1916.
Date of completion named in contract: January 31, 1917.
Amount of work done from beginning of work to and including June 30, 1916: Excavation, about 10,700 cu. yds.; Old masonry removed, about 200 cu. yds.; Standard concrete placed, about 420 cu. yds.; Structural steel placed, about 12 tons; Steel rods used for reinforcing concrete, about 21 tons.
Number of men ordinarily employed by the contractor from beginning of work to and including June 30, 1916: Day, about 102; Night, about 52.
Character of earth found in excavation: In the vicinity of Dexter street, below a few feet of filling, the excavation is in sand and gravel. In Southampton street, below the filling is sand and gravel and then clay.
Disposition of surplus earth: Hauled to vacant lots on or near Dorchester avenue in the vicinity of Andrew square.
Appendices in this report showing bids: DD, FF, GG, HH and II.
Assistant Engineer in charge of construction: Robert B. Farwell.

Construction work on this section was started at two places: first at the northerly end of the section, and second in Southampton street just southerly from the proposed Andrew Square Station. The open cut method is being used and the earth is hoisted to the surface in large buckets by traveling cranes and dumped into carts.

The excavation northerly from Dexter street has been finished and the invert and walls of the tunnel are being placed. The entire width was dug at one operation and the buildings were supported over the excavation. Across Dexter street and southerly therefrom the excavation is being made of a width sufficient to take in the easterly platform and invert and the center wall, the remaining width to be done later. In Southampton street the whole width of the tunnel is being excavated at once. The excavations are braced with 4-inch tongued and grooved hard pine sheeting and 12-inch square hard pine timbers.

To make room for a transfer station, with connections by stairways and escalators from and to the station below for tunnel trains, a line of stores on the westerly side of Dorchester avenue has been torn down. Five dwelling houses on Dexter street and Dexter place have been removed to other locations, and several other houses on Dexter and Ellery streets are to be torn down or

MELIOTYPE CO. BOSTON

EAST BOSTON TUNNEL EXTENSION, BOWDOIN STATION, LOOKING WESTERLY.

PLATE 14

removed elsewhere. This will enable the surface cars from all lines centering here to return by making a loop on the surface from Dorchester avenue to Ellery street and Southampton street back to Dorchester avenue, to Boston street or to Dorchester street. (See Plate 17.)

BOYLSTON STREET SUBWAY.

Repaving Boylston Street between Arlington and Carver Streets.

During the fall of 1915, Boylston street between Arlington street and a point about 50 feet east of Carver street was permanently repaved with wood blocks on a concrete base. Clark & Gore were the contractors. In connection with this work the Boston Elevated Railway Company raised to grade and relaid its tracks crossing Boylston street from Park square into Charles street, and the tracks in Bolyston street from the entrance to the subway incline west to Arlington street. New tracks to take the place of those formerly located in Boylston street were also laid by the Railway Company from Park square to Arlington street, one track on each side of the subway incline. As a part of this work the Railway Company constructed an additional island platform at the head of the incline between the southerly surface track and the tracks entering the subway.

The method of paving and care of car tracks was similar to the work done in paving Summer street.

The south roadway of Boylston street was first graded and repaved, and after traffic was turned on to this portion of the street the north roadway was paved.

EAST BOSTON TUNNEL EXTENSION.

Station Finish.

The interior finish of the stations at Scollay square and Bowdoin square was completed during the past year, and the tunnel was opened for traffic on March 18, 1916. Plate 14 shows the interior of Bowdoin Station looking westerly. The finish, which is of white cement plaster on the ceiling and upper portions of the walls with a wainscot of white terrazzo bordered with ceramic

tile, was described in the Twenty-first Annual Report. The following are some of the principal contracts for station finish:

DePaoli Mosaic Association,	Terrazzo tile wall finish, Scollay Under Station.
Anderson & Letteney,	Handrails, Scollay Under and Bowdoin Stations.
Lavers Granite Company,	Polished granite sides of coverings over entrance and exit, Bowdoin Station.
Deacon Brothers,	Polished granite sides of coverings over entrance and exits, Scollay Under Station.
Muir Brothers,	White cement plaster, Scollay Under Station.
Keith & Craffey,	White cement plaster, Bowdoin Station.
E. Van Noorden & Company,	Copper covered doors, Scollay Under and Bowdoin Stations.
Waldo Brothers,	White enameled tile, Scollay Under Station.
Albert I. Berry,	Granolithic, Scollay Under and Bowdoin Stations.
Otis Elevator Company,	Escalator, Scollay Under Station.

In connection with the work of finish of the Scollay Under Station some tile work and painting was done on the walls and ceiling of the Scollay Square Station above, which had been affected by the East Boston Tunnel Extension construction.

There is an ascending, double-file, cleat-type escalator running from the platform of the Scollay Under Station to the surface of the street, which is 39½ feet above. It has a capacity of 7,200 passengers per hour. Each file of the escalator is independently driven by a 20 horse power electric motor and has two traction driven handrails. The balustrades are of metal. On February 18, 1916, the escalator was subjected to the field tests as prescribed in the contract. These tests included measurements of the rise in temperature of different parts of the apparatus, tests of the brakes, speed of the escalator and the efficiency of the machine. The escalator satisfactorily passed all the tests.

As part of the finish work the stairways leading to the street at Bowdoin square, Hanover street and Scollay square and the escalator at Scollay square were housed in by structures with polished granite walls and concrete roofs. (See Appendix ZZ of Twenty-first Annual Report and Appendix G of this report for canvasses of bids.) The coverings over the stairways are about 4 feet high

HELIOTYPE CO. BOSTON

ESCALATOR AND EXIT STAIRWAY COVERINGS IN SCOLLAY SQUARE, LOOKING SOUTHERLY TOWARDS ENTRANCE TO TREMONT-STREET SUBWAY.

PLATE 15

and cover only about one-half of the stairway, the remainder being left open, the whole arrangement being designed so as to obstruct the view of the adjoining buildings as little as possible. The escalator is entirely covered and is closed in by means of four double swing copper covered doors. Plate 15 shows the escalator covering and the stairway covering in the middle of Scollay square. The concrete work forming the upper portion of the covering over the escalator and the roofs of the other stairway coverings was composed of crushed Quincy granite (the same kind of granite as that used in the polished walls) and cement, mixed in the proportion of one part cement to two parts crushed stone, the whole being darkened with a small proportion of lamp black. The surface of the concrete was rubbed smooth and polished to harmonize with the polished granite on which it rested. Illuminated copper covered signs, as shown in the photograph, are placed on the structures over the tunnel.

Paving along route of East Boston Tunnel Extension.

The granite block pavement from the northerly end of Tremont street, through Scollay square, Court street, Bowdoin square, a part of Green street, and Cambridge street between Bowdoin square and Lynde street, was relaid on a concrete base during the summer of 1915 under a contract with Coleman Brothers. (See Appendix I for canvass of bids.) In connection with this work the car tracks were raised to grade and relaid by the Boston Elevated Railway Company. The streets were repaved one side at a time and were kept open for traffic at all times except during nights and Sundays. On account of the extreme narrowness of Court street between Bowdoin and Scollay squares, it was necessary to turn it into a one way street while paving operations were going on.

EAST BOSTON TUNNEL.

When the East Boston Tunnel was constructed, a ventilating duct in the upper part of the arch was installed by making a diaphragm, a little over an inch in thickness, of concrete reinforced with expanded metal, suspended from the arch, as shown by Plates 7 and 8 of the Tenth Annual Report, between the Atlantic Avenue Station and a fan chamber near Webster street in East Boston. Repairs to the duct have been made from time

to time, including giving it additional support by means of heavy copper suspension wires hung crosswise on the under side of the duct. These repairs were necessitated by the corrosion of the original supports and of the reinforcement. A recent examination showed the corrosion to be general and far advanced. On two occasions some of the copper wire supports have been burned off by a trolley or by an electric current from feed wires or some other source. Accordingly the entire duct was removed, under contract, by Willis L. Learned. (See Appendix P.)

Grouting of shrinkage cracks and relatively porous places where small leaks occur in the arch and upper sidewalls has continued throughout the year. About 90 cubic yards of neat cement grout made from low-alumina cement have been used for this work.

STOCKYARD AT C AND CYPHER STREETS, SOUTH BOSTON.

Assistant Engineer in charge: Philip B. Walker.
Inspector in charge of structural steelwork: Alfred W. Parker.

This stockyard is used as a storage place for such materials as are furnished by the Commission to the various contractors engaged in the construction of the subways and tunnels.

These materials consist of asphalt and fabric for waterproofing, reinforcing rods, structural steel, cement, sewer pipe and fittings, grouting pipes, etc.

During the past year the following amounts of materials have been received at the yard:

Asphalt for waterproofing	573 tons
Waterproofing fabric	323,364 sq. yds.
Steel reinforcing rods	2,230 tons
Structural materials	1,500 tons
Cement	26,625 barrels
White quartz sand for plaster	83 tons

These materials were received at the yard in 298 freight cars.

Deliveries upon orders from the various sections under construction were made as follows:

Asphalt for waterproofing	609 tons
Waterproofing fabric	297,547 sq. yds.
Steel reinforcing rods	2,621 tons
Structural steel and iron	250 tons
Cement	26,783 barrels
White quartz sand	90 tons

To handle these materials an average force of 1 superintendent, 1 crane operator and 59 laborers was employed during the year.

All the reinforcing rods used in the construction of the various subways and tunnels are cut and bent accurately to shape at this yard before being delivered to the contractors. These rods are of open hearth steel and vary in size from ¼ inch square to 1¼ inch square and are of the following types: Diamond, Havemeyer, Slick, Corrugated, Square Twisted and Plain Square.

During the past year a total of 2,621 tons of reinforcing rods has been cut, bent and delivered to various sections.

The greater part of the cement used by any contractor on the construction of a section is shipped directly to him in carload lots. However, there is kept on hand at the stockyard approximately 5,000 barrels of tested cement to fill the orders for station finish, paving and grouting. This reserve supply is also available in an emergency for the use of any contractor doing work for the Commission and prevents delay in construction due to the non-arrival of cement which he has ordered. During the period covered by this report 26,783 barrels of cement of various brands have been delivered from this yard for finish, grouting and contract work. The brands of cement delivered for general use were Allentown, Lehigh, Giant, Nazareth and White Atlas.

Allentown and Lehigh cements, containing less than 6 per cent. of alumina, were used on sections where sea water might be encountered.

Some of the treads and risers for the stairways at "Bowdoin" and "Scollay Under" stations and practically all for the stairways at "South Station Under" have been cast in units at this yard and teamed to the work as desired. Each unit is composed of one reinforced concrete tread and riser cast together. One or more units may make up the full width of a stairway. Other special concrete shapes, such as ventilators and drain covers, are kept in stock.

The shop for fabricating structural steel has completed 697 tons of girders, beams, columns, footings, etc., during the past 12 months. An average daily force of 14 skilled iron workers has been employed in this department.

CEMENT TESTING DEPARTMENT AND CHEMICAL LABORATORY.

HAROLD C. DELONG, CHEMIST.

Cement Testing.—Samples have been tested from about 150,000 barrels of cement for use in the subways and tunnels under construction. The regular tests have been as follows: Soundness by the boiling test; Fineness by the 100 and 200-mesh sieves; Setting time; Tensile strength of neat briquettes at the age of 24 hours, 7 days and 28 days; of mortar briquettes, made in the proportion, by weight, of 1 part of cement to 3 parts of Standard Ottawa sand, at the ages of 7 days and 28 days.

Concrete Aggregates.—The aggregates used for concrete by the contractors have been regularly inspected and samples have been frequently taken and tested. The tests of sand have included a screen analysis, using the Nos. 4, 10, 20, 30, 40, 50, 80 and 100 screens, and determinations of tensile strength of briquettes made with mortar in the proportion, by weight, of 1 part of cement to 3 parts of sand, at the ages of 7 and 28 days.

Similar tests have been made of stone dust except that the briquettes for testing were made in the proportion of 1 part of cement, 1 part of sand and 1 part of stone dust.

The tests for coarse aggregate or stone include the determination for voids and a screen analysis, using the 2½", 2", 1½", 1", ¾", ½" and ¼" screens.

It has also been found advisable to test the strength of concrete made with varying kinds and proportions of aggregates. For this purpose concrete blocks have been made, in the form of cylinders, 8 inches in diameter x 16 inches long, and tested in compression at the age of 28 days or more. As the Commission has no testing machine large enough to break such blocks, some of them have been broken at the Watertown Arsenal and some under the direction of Prof. Harrison W. Hayward at the Massachusetts Institute of Technology.

Concrete beams, 6 inches x 6 inches x 3 feet, have also been made from mixtures in like proportions as for cylinders. These have been broken in the beam testing machine belonging to the Commission in the laboratory at the Cypher street yard.

Concrete.—The concrete as made by the contractor also has been tested in the shape of concrete blocks and beams just described. It is customary to divert to the laboratory a load of con-

crete which is being carted from the mixer to the work and fill a number of molds from the diverted load. These blocks when tested give an idea of the strength of the concrete which the contractor is producing, irrespective of more or less theoretical laboratory tests.

Asphalt and Asphalt-Saturated Cloth.—The routine tests which are made on these materials are as follows:

For Asphalt.—The melting point, the loss in weight when 50 grams are heated at 325° F. for 7 hours, and the solubility in cold carbon disulphide are determined.

For Asphalt-Saturated Cloth.—The weight of saturated cloth per square yard, the weight of unsaturated cloth per square yard, the amount of asphalt saturation per square yard, the solubility of the asphalt saturation in carbon disulphide, and the tensile strength and elongation of saturated and unsaturated cloth both lengthwise and crosswise are determined. The threads of the saturated cloth are examined under a microscope to determine if they are properly saturated.

When new waterproofing materials are submitted for examination additional tests are made. In the laboratory these consist of the following:

For Asphalt.—Tests for brittle point; Tests for penetration with the New York Testing Laboratory Penetrometer, both before and after heating at 325° F. for 7 hours; Specific gravity; Analysis for paraffin; Test for adulteration with coal tar; Determination of flash point.

For Asphalt-Saturated Cloth.—Test of asphalt from the different brands of saturated cloth for adulteration with coal-tar; Observations of chemical action of asphalt from the saturated cloth when in contact with Standard Waterproofing Asphalt, M. P. 190, which is used on construction work in alternate layers with the saturated cloth.

With new brands of saturated cloth it is also customary to request samples of the raw fabric from which the saturated cloth is made. On these are made the following tests:

Weight per square yard; Tensile strength lengthwise and crosswise; Elongation lengthwise and crosswise; Description of weave.

By comparing the saturated cloth with the raw fabric the effect of saturation on the width, weight per square yard, tensile strength, elongation, etc., are determined.

Field tests are also made in the manner described in the last annual report.

Water Analysis.—Frequent samples of ground water are taken from the excavations at the various sections of subway or tunnel under construction, and are analyzed for contents of chlorine and frequently for sulphates. The chief purpose is to study the percentage of sea water. Rough qualitative analyses are also made for sewage contamination.

The greater part of Section E of the Dorchester Tunnel is under Fort Point Channel and Sections G, H and J are adjacent to the South Bay, and as a result the soil in which they are located is impregnated with sea water. It has been found from tests that in general those brands of cement which contain less than 6½ per cent. of alumina can best resist the deteriorating action of sea water, and consequently it was deemed advisable to use exclusively cement of this character on the above-named sections. Most of the cement which is being furnished for these sections contains less than 6 per cent. of alumina. Various brands of cement were given accelerated tests in concentrated sea water, as mentioned in the Twentieth and Twenty-first Annual Reports, to determine their fitness for this work.

Air Analysis.—The specifications for work in the tunnels require that the volume of fresh air to be supplied shall be sufficient to permit work without danger or discomfort, and at all times and places to prevent the accumulation of carbon-dioxide to a greater amount than one part in one thousand by volume. To determine whether the ventilation provided is sufficient to comply with the requirements of the specifications, samples of air are taken from the headings of the various drifts or tunnels and analyzed for carbon-dioxide.

MISCELLANEOUS TESTS.

Test of Paints.

A test of paints for bonding strength with concrete, and as to protective qualities against electrolytic action when used on steel embedded in concrete was started in the previous year, and some prelimiinary results are given in the Twenty-first Annual Report, page 54. Seven different varieties of paint have been tested.

The paints were first given weathering tests and tests for action when in contact with alkali water, acid water, and sea water. The results of these tests were very varied, some of the paints failing badly to pass the weathering tests and the alkali water test, both of which tests should be passed by any paint used by the Commission.

For the bonding and electrolytic test, plain round ¾" steel rods were carefully cleaned and cut in 24" lengths. After being painted with the requisite coats of paint and allowed to dry for a proper time, the rods were embedded for 11" of their length on the long axis of concrete cylinders which were 12" long by 6" in diameter. The concrete was proportioned by volume 1 part of cement to 2 parts of sand to 3½ parts of broken stone (sized ⅜" to 1½"). The rods were allowed to set in the concrete blocks, undisturbed for two months. Three rods of each series were then pulled out of the concrete in a testing machine at the Massachusetts Institute of Technology, under the direction of Prof. H. W. Hayward, and the bonding strength of the painted rod with the concrete measured. Some plain, unpainted rods had been buried in cylinders and the bonding strength of the painted rods was found to be much less than for these. The best bonding strength of any of the painted rods was only about 1/5 that of the plain rods. The second best bonding was only about 1/6 that of the plain rods. The other paints gave bonding strengths between 2 per cent. and 10 per cent. of the plain rods.

For the electrolytic test six of the remaining embedded specimens were placed in an electric circuit as follows: The cylinders were set in large stoneware jars. Some of these jars were filled with fresh water and some with sea water. Outside of the cylinder a sheet of galvanized iron, bent to form a ring of about 7" diameter, was placed, so that a clearance of about one-half an inch was left between the galvanized iron and the concrete cylinders. The rod end not embedded in concrete was made the anode in the electric circuit and the galvanized iron the cathode, the current thus passing down through the rod, through the paint, then through the conocrete and water to the galvanized iron. The conditions were similar to very possible subway conditions. The voltage was maintained uniform at 15 volts. By means of an ammeter it was possible to observe the amount of current which passed through the paint on the rods. In the circuit just described

the paint on the rods was practically the only material which would prevent the passage of the electric current, all the other materials being good conductors. All the paints tested were claimed by the makers or dealers to be perfect insulators against electric currents. This test which has now been carried on since September, 1915, has disproved most of these claims. Some of the paints broke down within a few weeks and allowed the usual disintegrating effects of electrolysis to take place. All but two broke down within a few months.

Floor Hardeners and Wear Resisters.

Several patented compounds have been submitted in the past year or two which are claimed to make granolithic floors wear-proof and dustproof. In general these compounds are objectionable for station platforms for the reason that they almost invariably make granolithic floors much smoother and consequently more slippery. However, in order to make sure that no useful product for subway work was being overlooked, tests were made on a number of these compositions during the last eighteen months. The manner of testing was as follows: Slabs of concrete were made one yard square, which were topped with regular granolithic such as the Commission is accustomed to use. Each of these slabs was then treated with a compound according to directions of the maker or dealer. The slabs, together with a plain untreated slab, were set in the floor of the rod shed at the Cypher Street Yard in such a manner that all the slabs were in line and each received an equal amount of traffic.

Tests of Integral Waterproofing Compounds.

Many such compounds have been submitted at various times to the Commission. Some may have merit if it is conceded that the integral system itself is desirable. With others the effects are not lasting. Briquettes of mortar in which the integral compounds were mixed show a decided weakening effect in tensile strength when tested. Five integral waterproofing compounds have been tested during the past year. Any of these compounds may bar the passage of water through the mass of the concrete temporarily. None of them will prevent the passage of water through shrinkage cracks, and it is through such cracks that the majority of leaks on the Commission's work would occur

if the asphalt waterproofing were not used. The mass of the concrete when properly mixed and placed according to the specification is practically waterproof.

Test of Lamp Blacks.

This test is described in the Twenty-first Annual Report, page 56. The indications there stated, viz., that the more expensive lamp blacks have much more coloring than the cheaper ones, have been confirmed by further observations.

Test for Effects of Carborundum in Granolithic.

This test is described in the Twenty-first Annual Report, page 55. The indications there reported on have been confirmed by further observations, viz.: Granolithic made with carborundum sprinkled on the surface and troweled in is not as satisfactory as that in which carborundum to the extent of not less than 10 per cent. of the weight of the cement is mixed with the mortar used for surfacing.

Test of Effects of Washing Soda in Mixed Mortar.

Claims having been made by one of the contractors for plastering that washing soda mixed in Portland cement mortar would cause the cement to set quicker, tests were made, and they showed that the washing soda caused a slight early stiffening of the plaster, but had very little effect on the actual setting up of the cement as determined by actual cement testing standards. It was also shown that the washing soda had a decided weakening effect on the Portland cement mortar.

Other Tests.

Many other tests than those heretofore mentioned have been made, including tests on the moisture and sand content of clay encountered in the subway work, analyses of concrete and mortar from various parts of the work, tests of paving gravel, test of crushed granite and of white sand for decorative work, tests of hollow fireproof tile, and attempts to discover an absorption test for asphalt-saturated cloth.

An unusually large amount of work has been done this year in testing asphalt-saturated cloths. This work has been done both

on new samples and on the cloth already purchased by the Commission.

ENGINEERING FORCE, ETC.

The names of all who have been employed in connection with the engineering force more than one month during the past year are given in Appendix E. I am indebted to all for their co-operation.

The work in compressed air beneath Fort Point Channel is being carried on under the direct charge of Assistant Engineer G. Dana Emerson, with a party of assistants and inspectors. No employees of the Commission have been allowed to work in compressed air, unless, after a thorough examination by the physician of the Commission, Dr. William F. Temple, Jr., they have been found physically qualified for such work; and none of them has suffered any serious effects therefrom.

The last of the sections for the Dorchester Tunnel are now under contract. There will be, however, some minor contracts to be let, such as for repaving the streets over the work, coverings over stairways and surface platforms, finishing the interior of the Broadway and Andrew-square stations. Some of the more important items for finishing these stations will be placing terrazzo and white cement plaster over ribbed terra cotta tile on the walls, and white cement plaster on the ceilings, building stairs and partitions, installing escalators, handrails, copper covered doors, fences, etc.

The contractors for the various sections have recently been considerably handicapped on account of the growing scarcity of efficient labor, and the conditions are such that there seems to be no prospect of early relief.

Respectfully submitted,

EDMUND S. DAVIS,

Chief Engineer.

APPENDIX A.

[SPECIAL ACT, CHAPTER 342.]

AN ACT TO PROVIDE FOR THE CONSTRUCTION OF AN ADDITIONAL STATION IN THE BOYLSTON STREET SUBWAY IN THE CITY OF BOSTON.

Be it enacted, etc., as follows:

SECTION 1. The Boston transit commission, hereinafter called the "commission", shall, after the contract for the use thereof is made as hereinafter provided, construct in the city of Boston, hereinafter called the "city", an additional station in connection with the Boylston street subway, so-called. Said station shall be located at or near Arlington street, or at or near a point on the Boyston street subway substantially midway between the Copley square station in the Boylston street subway, and the station at the corner of Boylston and Tremont streets, provided for by Part I of chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven. Said station shall be of such kind, character and dimensions as the commission shall determine, and shall conform to the general design, character and dimensions of the other stations in the Boylston street subway.

The commission is hereby authorized to make such changes in the grades of the present tunnel as may be necessary for the proper construction of the said station and its entrances and exits, and may devise and use any means that it may deem proper to connect for easy access the north and the south platforms of the said station.

SECTION 2. The commission shall, immediately after the passage of this act, make such preliminary investigations, surveys and plans as may be necessary or desirable to carry out the purposes of this act, and to that end may enter upon any lands, and place and maintain marks therein, and may make excavations, borings, and do all other acts necessary for such investigations and surveys, and may expend such sums as it deems necessary therefor. The expenses incurred in making such preliminary investigations, surveys and plans shall be deemed a part of the cost of the work.

SECTION 3. The commission shall not begin the work of construction until it has filed in the office of the city clerk of the city of Boston a plan signed by the commission showing the proposed layout of the station and the location of the approaches thereto and connections therewith, and the alignment and grade of the platforms, which plans shall be submitted for its approval to the Boston Elevated Railway Company, hereinafter called the "company", which term shall be deemed to include its successors and assigns. Any such plans so filed may be altered at any time by a new plan signed and filed in like manner.

SECTION 4. The commission may make contracts in the name of the city for the work herein authorized, but all contracts involving two thousand dollars or more in amount shall be in writing, and shall be signed by the contractor and a majority of the commission, and no such contract shall be altered except by an instrument in writing signed by the contractor and a majority of the commission, and also by the sureties, if any, on the bond given by the contractor for the completion of the original contract. No such contract or alteration of any such contract shall be valid or binding on the city unless executed in the manner aforesaid.

SECTION 5. All work done under this act, under or near public streets and places, shall be conducted, so far as may be practicable, in such manner as to leave such streets and places, or a reasonable part

thereof, open for traffic between the hours of eight in the forenoon and six in the afternoon of each secular day except public holidays.

SECTION 6. The commission may, for the purposes of this act, use public ways and lands without compensation therefor, and the commission may, for the said purposes, acquire for the city by purchase or otherwise, or may take lands in fee, and easements, estates and rights in land, including the right to go under the surface thereof, or through or under buildings or parts of buildings thereon or any leasehold rights, or other rights therein, or relative thereto; and such takings in fee or otherwise may be made whether the lands or other rights taken or otherwise affected are held under title derived by eminent domain or otherwise and the commission may, for such purpose, acquire for the city by purchase, or otherwise, or may take any property and rights of any kind deemed by it essential to the construction of said station. A taking or purchase under this section of an easement or other estate or right in a given parcel of real estate or any right taken, whether such parcel or other right taken, consists of unimproved land or of land and buildings or rights of any nature, may be confined to a portion or section of such parcel or right fixed by planes of division, or otherwise, below or above or at the surface of the soil, and in such case no taking need be made of upper or lower portions, or other parts or sections thereof, except of such easements therein, if any, as the commission may deem necessary. The commission, to make any taking by right of eminent domain, shall cause to be recorded in the registry of deeds for the county of Suffolk a description of the lands, easements, estates or rights to be taken, as certain as is required in a common conveyance of land, with the statement that the same are taken under authority of this act, which description and statement shall be signed by the commission, and the lands, easements, estate or rights therein described, shall, upon such recording, vest in the city. The commission shall, so far as may be practicable, notify all known owners of such takings, but the validity thereof shall not be affected by want of such notice.

SECTION 7. The commission may sell the buildings or other structures upon any lands taken by it, or may remove the same, and shall sell, if a sale be practicable, or if not, shall lease, any lands or rights or interests in lands or other property taken or purchased for the purposes of this act, whenever the same shall, in the opinion of the commission, cease to be needed for the said purposes. The proceeds of any such sale or lease shall be deducted from the cost of the said station for the purpose of ascertaining the rental thereof.

SECTION 8. The commission shall determine and award the damages sustained by any person by reason of property, except public ways or lands, taken or injured by the commission under authority of this act and may agree with any person as to the amount to be paid as damages sustained by him for any property so taken or injured, which damages the city shall be liable to pay. If any such person is dissatisfied with the award, or cannot agree with the commission upon his damages, the same may be determined by a jury in the superior court for the county of Suffolk, on petition of such person or of the commission, in which latter case such person shall be joined as a petitioner against the city, filed in the clerk's office within one year after the property is taken or injured; and judgment shall be entered upon the determination of the jury, and costs shall be taxed and execution issue in favor of the prevailing party, as in other civil cases. The members of the commission shall not be liable personally for any such damage.

SECTION 9. The commission may order the temporary removal or relocation of any surface tracks, and the temporaey or permanent removal or relocation of any conduits, pipes, wires, poles, or other property of any person or corporation which it deems to interfere with the con-

struction or operation of the subways and connections, and shall grant new locations for any such structures so removed or relocated. Such orders, to the extent specified therein, shall be deemed a revocation of the right or license to maintain such tracks, conduits, pipes, wires, poles, or other property, and the owner of any such structures in public ways or lands shall comply with such orders without expense to the city. If any such owner shall fail to comply with the order of the commission within a reasonable time, to be fixed in the order, the commission may discontinue and remove such tracks, conduits, pipes, wires, poles, or other property, and may relocate the same, and the cost of such discontinuance, removal, or relocation shall be repaid to the city by the owner. No such discontinuance, removal, or relocation shall entitle the owner of the property thus affected to any damages on account thereof. Any such structures in or upon private lands may be removed and relocated by the commission, or if removed and relocated by the owner thereof, the reasonable expense shall be repaid to him by the commission. Any gas or electric lighting company may shut off the gas or current from any pipes or wires affected by any acts done hereunder, so far, and for such time, as may be necessary to prevent the escape or explosion of gas, or other public danger.

SECTION 10. The commission, in the name and behalf of the city of Boston, and the company, before work hereunder is begun, are hereby authorized and requested to enter into a contract in writing for the sole and exclusive use of the station herein provided for by the company for the running of its cars therein, and for such other uses as the commission and the company may agree upon, for a term from the beginning of the use thereof to the expiration of the contract now in existence between the city and the company for the use and operation of the said Boylston street subway, and the running of cars therein, at a reasonable annual rental not exceeding four and one-half per cent. of the net cost of the station herein provided for. Said contract shall include such other provisions and conditions following the form of the lease now in existence for the use of the Boylston street subway, so far as the same may be applicable, as the commission and the company may agree upon, or as shall be determined under this act. The reasonable terms, provisions, and conditions of such contract, if not agreed upon by the commission and the company, shall be determined as hereinafter provided. The provisions of this act, in so far as they declare, define or establish the terms and conditions for the construction, tenure, maintenance, and operation of the station, shall be embodied in and made part of said contract. The use of the station shall begin when, in the opinion of the commission, a reasonable time after completion has been allowed for equipment. The net cost thereof shall be deemed to include, except as is otherwise provided herein, all expenditures incurred in acquisition and construction, including damages, expenses and salaries of the commission, and interest at three and one-fourth per cent per annum on the debt incurred in construction prior to the beginning of the use.

Any interest received by the city upon the proceeds of the bonds prior to the expenditure of such proceeds shall be credited against interest during construction in ascertaining the net cost of said station.

In respect to the equipment, use and operation of the station, the company shall have all the powers and privileges, and be subject to all the duties, liabilities, restrictions and provisions set forth in all general and special laws now or hereafter in force applicable to it.

The use and control of the station, if acquired by the company, shall be subject to the rights, if any, which the West End Street Railway Company may have under the provisions of article two of its lease to the company, dated December nine, eighteen hundred and ninety-seven, or otherwise.

SECTION 11. The commission shall fix a time and place, within six months after the passage of this act, when it will meet the officers of the company for the purpose of agreeing upon the terms of a contract for the sole use of said station by the company under the provisions of this act, and shall endeavor to bring about an agreement as to the terms of such contract and to procure the same to be executed. If the terms of the contract are not agreed upon by the commission and the company within nine months after the passage of this act, that fact shall be certified by the commission to the public service commission. The public service commission shall, within three months thereafter, set a date for a hearing, and shall notify the city of Boston, the commission, and the company of the hearing. The public service commission, after such hearings as it deems necessary and after giving full consideration to the rights and equities of the city, the public, and the company, shall determine upon a reasonable rental and other reasonable terms for such a contract for the sole use of said station, and shall notify the company and the commission of its finding, and shall request the company and the commission, in the name of the city, to enter into such a contract upon the terms so found and determined by the public service commission.

If the company shall not accept the terms so fixed on or before the first day of July, in the year nineteen hundred and seventeen, the public service commission shall certify that fact to the governor and council.

SECTION 12. Upon the determination by the commission of any important question arising in the course of the work herein provided for, except on award of or agreement upon damages, as provided in section eight hereof, the company may, within three days after notice of such determination, apply to the commission for a revision of the same, and thereupon the commission may consider and determine such question, subject to any right of appeal that any person interested may have under existing laws.

SECTION 13. The treasurer of the city shall from time to time, on request of the commission, issue and sell at public or private sale the bonds of the city, registered or with interest coupons attached, as he may deem best, to an amount not exceeding the cost herein provided for. Such bonds shall be designated on their face, Arlington Station Bonds, shall be for such terms, not exceeding fifty years, as the mayor and treasurer of the city may determine, and shall bear interest payable semi-annually at such rate, not exceeding four per cent. per annum, as the treasurer shall determine. The debts incurred by the city from time to time under the provisions of this act shall not be included in determining the statutory limit of indebtedness of the city, and the proceeds of the bonds shall be used to meet all damages, costs and expenses incurred by the commission or by the city in carrying out the provisions of this act. The board of commissioners of sinking funds shall establish a sinking fund for the payment of the bonds issued under this act. All premiums received from the sale thereof shall be paid into the sinking fund. All rents, tolls, percentages or other annual compensation received by the city for any use of the station under this act or for any use of any lands or rights taken under authority of this act shall annually be used by the treasurer,—first, to meet the requirements of any deficiency in the said sinking fund; second, to meet the interest on the bonds; and the surplus, if any, as a part of the general revenue of the city. The proceeds from any sale or lease of lands or rights acquired by purchase or otherwise under authority of this act shall be paid into the said sinking fund, or shall be used for construction, as the commission may determine.

SECTION 14. The company, for the equipment of the station authorized by this act and for all expenditures by the company required or au-

thorized hereby, may, from time to time, in the manner and subject to the requirements prescribed by law, issue and dispose of such amounts of its capital stock or bonds, each, at its option, in addition to the amounts heretofore authorized, as may be necessary.

SECTION 15. The city shall have, hold and enjoy in its private or proprietary capacity, as its own property, the said station, and all rents, tolls, income and profits from all contracts entered into by it for the use of said station or any part thereof, and the same shall never be taken by the commonwealth except on payment of just compensation.

SECTION 16. If the commission shall cease to exist before the completion of the work herein provided for, the city shall have all the rights, powers and privileges, and be subject to all the duties, restrictions and liabilities hereby conferred or imposed upon the commission in respect thereto, and the said powers and duties shall be exercised and performed by the mayor, city engineer and city treasurer in place of the commission.

SECTION 17. The supreme judicial court and the superior court, upon application of any party in interest, the city or any ten taxable inhabitants thereof, may enforce the provisions of this act or prevent violation of the same by any appropriate process.

SECTION 18. The construction of the said station herein authorized shall be begun at such time within one month after the contract herein provided for is made as the commission and the company may agree upon.

SECTION 19. This act shall take effect upon its passage. [*Approved May* 26, 1916.

APPENDIX B.

[CHAPTER 40.]

RESOLVE RELATIVE TO A NEW SUBWAY IN THE DORCHESTER DISTRICT OF THE CITY OF BOSTON.

Resolved, That the Boston transit commission is hereby authorized and directed to investigate the matter of constructing a subway to extend from the present terminal of the Dorchester tunnel at Andrew square in the city of Boston to a point at or near Upham's Corner in the Dorchester district, and especially to determine the most feasible route for the subway and the probable cost of construction. The commission shall report the result of its investigation to the general court on or before the first Monday of January, nineteen hundred and seventeen. ([*Approved April* 4, 1916.

APPENDIX C.

[CHAPTER 96.]

RESOLVE PROVIDING FOR AN INVESTIGATION BY THE BOSTON TRANSIT COMMISSION RELATIVE TO THE CONSTRUCTION OF AN ELEVATED RAILWAY STATION NEAR THE CORNER OF CHARLES AND LEVERETT STREETS IN THE CITY OF BOSTON.

Resolved, That the Boston transit commission is hereby authorized and directed to make an investigation as to the necessity and advisability of providing for an additional elevated railway station at or near the corner of Charles and Leverett streets in the city of Boston. The said commission shall report the result of its investigation, with any recommendations which it may deem necessary, to the next general court not later than the second Wednesday of January. [*Approved May* 17, 1916.

APPENDIX D.

[CHAPTER 158.]

RESOLVE PROVIDING FOR A SPECIAL COMMISSION TO CONSIDER THE FINANCIAL CONDITION OF THE BOSTON ELEVATED RAILWAY COMPANY.

Resolved, That the lieutenant governor, the president of the senate, the speaker of the house of representatives, two members of the senate to be appointed by the president, four members of the house to be appointed by the speaker, and the members of the public service commission and the Boston transit commission be, and hereby are, made a commission to consider the financial condition of the Boston Elevated Railway Company, and what changes, if any, should be made in existing laws relative to that company to enable it to meet the reasonable demands of the public for the extension and improvement of its system of transportation; also the advisability of any changes in subway rentals, any reduction in taxes, and any increase in fares or changes in the present transfer system. Said commission shall report to the next general court not later than the fifteenth day of January, its recommendations for legislation relative to the above matters, and such further recommendations as in their judgment may be necessary or desirable to enable the company to provide a more efficient service and improve its credit. The lieutenant governor, the president of the senate, the speaker of the house, and the members of the public service commission and the Boston transit commission, shall receive no compensation for such service. The other members shall receive such compensation as may be approved by the governor and council, and the commission may, subject to like approval, incur necessary expenses. [*Approved June* 1, 1916.

APPENDIX E.

The names of all the assistants in the Engineering Department who have been employed for more than one month during the past year, together with an indication of some of the work on which each has been engaged, are given below.

Assistant Engineers.

LEON N. ALBERTS,	Plans and studies, Dorchester Tunnel.
CHARLES H. BARTLETT,	Detail work, designs for steel structures.
**BION A. BOWMAN,	Designs for steel and reinforced concrete structures.
*C. LEONARD BROWN,	Inspection, Sections B and C, Dorchester Tunnel.
JAMES D. BURNS,	Plans, Dorchester Tunnel.
FRANCIS V. CAREY,	Miscellaneous work, Section 2, Boylston Street Subway; plans, Dorchester Tunnel.
WILBUR W. DAVIS,	In charge of construction, Enlargement of Park Street Station, and Section G Dorchester Tunnel.
***FREDERICK C. H. EICHORN,	Inspection, Sections D and G, Dorchester Tunnel.
G. DANA EMERSON,	In charge of construction, Sections C, D, E and F, Dorchester Tunnel.
ROBERT B. FARWELL,	In charge of construction, East Boston Tunnel Extension, and Sections H and J, Dorchester Tunnel.
*JAMES B. FLAWS,	Plans, Dorchester Tunnel.
JAMES T. FRAME,	Field work for construction of Sections D and F, Dorchester Tunnel.
AUSTIN B. HENDERSON,	Plans for detail work, Dorchester Tunnel.
LEONARD B. HOWE,	Steel and concrete design, Dorchester Tunnel.
WILLIAM W. LEWIS,	In charge of surveys and plans and miscellaneous work, Dorchester Tunnel.
ROY M. LOTHROP, ..	Contract and detail plans, East Boston Tunnel Extension and Dorchester Tunnel.
LAURENCE B. MANLEY,	In charge of interior finish in Bowdoin and Scollay Under stations, and South Station Under, also of repaving streets over tunnel and subway work.
LAURENCE K. MARSHALL,	Construction, Section E, Dorchester Tunnel.
CLARENCE D. MAYNARD,	Field work for construction of Sections H and J, Dorchester Tunnel.

*Left the employ of the Commission.
**Of late has worked only part of the time.
***Also ranks as inspector.

***PERCIVAL H. MOSHER,	Inspection, Sections D and E, Dorchester Tunnel.
PHILIP C. NASH,	Field work for construction of Enlargement of Park Street Station, and Section G, Dorchester Tunnel.
*GEORGE F. OWEN,	Plans for Dorchester Tunnel; construction overflow sewer, Section H, Dorchester Tunnel.
LAURENCE M. PITMAN,	Line and grade work, Sections D, E and F, Dorchester Tunnel.
ROLAND B. RAND,	Plans for steel details, Dorchester Tunnel.
*RALPH E. RICE,	Plans for station finish, East Boston Tunnel Extension and Dorchester Tunnel.
**BARZILLAI A. RICH,	Designs for structures, Dorchester Tunnel.
ERNEST R. SPRINGER,	Designs for steel and reinforced concrete structures and in charge of steel construction.
GEORGE H. STEARNS,	In charge of designs for steelwork and reinforced concrete structures.
HERBERT R. STEARNS,	Designs and plans, Dorchester Tunnel.
***LEO S. STONE,	Interior finish of stations, East Boston Tunnel Extension and Dorchester Tunnel; inspection, Section E, Dorchester Tunnel.
ROBERT K. TAYLOR,	Construction, Section E, Dorchester Tunnel.
PHILIP B. WALKER,	In charge of work at stockyards at Cypher street and at Canal street, also of grouting work in East Boston Tunnel.

Draftsmen.

*PAUL P. BANGS,	Blueprinting, assisting photographer, etc.
**CHARLES R. BERRY,	Filing plan, Dorchester Tunnel, and report plan.
RALPH A. FISHER,	Details of steelwork, at office and shop.
W. ANTHONY FORD,	Plans, Dorchester Tunnel.
*W. AUGUSTINE FORD,	Plans, Dorchester Tunnel.
GEORGE P. GOODMAN,	Drafting and photography.
SAMUEL C. LYMAN,	Steel construction and inspection, at Cypher-street stockyard, for East Boston Tunnel Extension and Dorchester Tunnel.
*CHARLES B. MCNALLY,	Plans, East Boston Tunnel Extension and Dorchester Tunnel.
EDMUND A. RICE,	Plans, Dorchester Tunnel.
CHESTER A. RICHARDSON,	Plans and structural designs for Dorchester Tunnel.
FREDERIC W. STILES,	Plans, miscellaneous line and grade work, force acounts, etc.
LAURENCE E. WEEKS,	Plans and miscellaneous line and grade work.
JOHN M. WISEMAN,	Plans for steelwork.

*Left the employ of the Commission.
**Of late has worked only part of the time.
***Also ranks as inspector.

Assistants, Instrumentmen.

RICHARD A. CASWELL,	Line and grade work, Sections H and J, Dorchester Tunnel; plans, Dorchester Tunnel.
WILLIAM J. COCHRAN,	Line and grade work, Section G, East Boston Tunnel Extension, and Sections F and H, Dorchester Tunnel; plans, Dorchester Tunnel.
HENRY L. CROCKER,	Line and grade work, Sections D, E and F, Dorchester Tunnel.
LESTER S. DANIELS,	Line and grade work, Sections H and J, Dorchester Tunnel.
*JOHN F. A. GIBLIN,	Line and grade work, and assisting on inspection, Sections D and E, Dorchester Tunnel.
CHARLES H. HARRINGTON,	Line and grade work, Section E, Dorchester Tunnel.
*JOHN A. HOLBROOK,	Record plans, line and grade work, for repaving streets and for station finish.
ARTHUR V. LYNCH,	Construction, Section E, Dorchester Tunnel.
*RALPH C. MCPHERSON,	Line and grade work, overflow sewer, Section H, Dorchester Tunnel; plans for Dorchester Tunnel.
BUCKINGHAM MILLER,	Inspection, Section E, Dorchester Tunnel.
DANIEL G. MOSHER,	Line and grade work, and inspection of station finish, Section D, Dorchester Tunnel.
WILLIAM G. NORTEMAN,	Line and grade work, and inspection, Section E, Dorchester Tunnel.
*JAMES H. O'CONNOR,	Miscellaneous work, force accounts, station finish in East Boston Tunnel Extension and Dorchester Tunnel.
WILLIAM J. POWER, JR.,	Line and grade work, Section E, Dorchester Tunnel; station finish, East Boston Tunnel Extension.
HARRY H. THORBURN,	Line and grade work, Enlargement of Park Street Station, and Section G, Dorchester Tunnel.
SIDNEY S. VON LOESECKE,	Line and grade work, Enlargement of Park Street Station, and Section G, Dorchester Tunnel.
*HARRY S. WRIGHT,	Inspection, Section E, Dorchester Tunnel.
WILLIAM L. WRIGHT, JR.,	In charge of line and grade work, Section E, Dorchester Tunnel.

Assistants, Rodmen.

*ALMER E. BLUNT,	Line and grade work, Section E, Dorchester Tunnel.
***WILLIAM G. DOHERTY,	Line and grade work, and inspection, Sections D and F, Dorchester Tunnel.

*Left the employ of the Commission.
**Of late has worked only part of the time.
***Also ranks as inspector.

JOHN P. FARRELL,	Line and grade work, Sections H and J, Dorchester Tunnel.
HARRY H. LYNN,	Line and grade work, Sections D and F, Dorchester Tunnel.
MORA L. MILLER,	Line and grade work, Section G, and overflow sewer, Section H, Dorchester Tunnel.
EDISON F. SAWYER,	Line and grade work, Section E, Dorchester Tunnel.
*MAX SILVERMAN,	Line and grade work, Section E, Dorchester Tunnel.
CHESTER C. TOPHAM,	Line and grade work, Section E, Dorchester Tunnel.

Inspectors.

WILLIAM A. BICKFORD,	Concrete mixing for Sections F and J, Dorchester Tunnel, since May 16, 1916.
RUFUS W. BILLINGS,	Section E, Dorchester Tunnel.
JOSEPH E. CAHILL,	Concrete mixing for Sections D and G, Dorchester Tunnel.
*FRED W. CARLSON,	Section E, Dorchester Tunnel.
MARTIN C. CHERRY,	Sections E, F and H, Dorchester Tunnel.
FRANK I. GARFIELD,	Sections H and J, Dorchester Tunnel.
*SAM GOLDMAN,	Concrete mixing for Section H, Dorchester Tunnel.
JOSEPH J. JOLLEY,	Concrete mixing for Section E, Dorchester Tunnel.
AUSTIN E. JOYCE,	Section E, Dorchester Tunnel.
THOMAS H. KEENAN,	Grouting, Section B, East Boston Tunnel.
*PHILIP H. LADD,	Section E, Dorchester Tunnel.
HERBERT D. LEARY,	Sections D, H and J, Dorchester Tunnel.
*CHESTER F. LEWIS,	Concrete mixing for Section H, Dorchester Tunnel.
THOMAS J. MAGNER,	Concrete mixing for Section E, Dorchester Tunnel.
JOHN P. MCKNIGHT,	East Boston Tunnel Extension; Enlargement of Park Street Station; Section 2, Boylston Street Subway; Section G, Dorchester Tunnel.
*JOHN MILLER,	Section E, Dorchester Tunnel.
*ROBERT P. O'KEEFE,	Sections G and H, East Boston Tunnel Extension, and Enlargement of Park Street Station.
ALFRED W. PARKER,	Inspector in charge of structural steelwork.
JOSEPH E. REINHALTER,	Sections D, G and H, Dorchester Tunnel.
WILLIAM G. TONNER,	Section E, Dorchester Tunnel.
JOHN F. WATERS,	Concrete mixing for Sections F, H and J, Dorchester Tunnel.
‡**FRED E. WEBBER,	Concrete mixing for Sections E and G, Dorchester Tunnel.

*Left the employ of the Commission.
‡**Also ranks as rodman.

Chemists, Testing Material, Etc.

*HAGOP H. AROYAN,	Testing Cement.
SETH M. BRYANT,	Testing Cement.
*HAROLD C. DELONG,	Chemist in charge of testing cement, asphalt and other materials.
*JOSEPH D. DOYLE,	Testing cement.
A. H. KHACHADOORIAN,	Chemist.

Clerical Force.

WILLIAM A. BICKFORD,	Clerk and bookkeeper at Cypher-street stockyard until November 1, 1915.
ARTHUR B. CARTER,	Secretary to the Chief Engineer.
HARRY E. CASEY,	Stenographer.
CHARLES E. FAY,	Messenger in drafting room, blueprinting, care of plans.
FRANCIS J. KURRISS,	Clerk and stenographer.
*BERTHA M. MCNALLY,	Temporary stenographer.
THOMAS J. MULDOON,	Stenographer at Cypher-street stockyard.
THOMAS J. PETTIT,	Clerk and stenographer.
JOHN E. RYAN,	Stenographer.
JOSEPH P. SHEERIN,	Clerk.
FRANK A. SMITH,	Clerk and bookkeeper at Cypher-street stockyard.

*Left the employ of the Commission.

APPENDIX G.

CANVASS OF BIDS FOR FURNISHING AND ERECTING POLISHED GRANITE WALLS FORMING PART OF COVERINGS OVER THE HANOVER STREET STAIRWAY, SCOLLAY SQUARE EXIT STAIRWAY, AND SCOLLAY SQUARE ESCALATOR, SCOLLAY UNDER STATION, EAST BOSTON TUNNEL EXTENSION. AUGUST 4, 1915.

BIDDER.	Lump Sum Price.	Kind of Granite.	Time of Completion.
Lavers Granite Company, Quincy, Mass.....	$2,550.00	Quincy.	"We could commence to set this work four weeks from date of order."
Rockport Granite Company, Rockport, Mass.....	$2,250.00	Rockport gray granite.	In six weeks.
Deacon Brothers, Quincy, Mass.....	$1,933.00	Quincy or Rockport granite.	"In five weeks from receipt of order providing the foundations are ready to set the work."

APPENDIX H.

CANVASS OF BIDS FOR FURNISHING 300 TONS OF REINFORCING RODS EQUAL IN SECTION TO 1 INCH SQUARE AND 1,000 TONS OF REINFORCING RODS EQUAL IN SECTION TO 1¼ INCH SQUARE, DELIVERED F. O. B. CARS BOSTON, VIA N. Y., N. H. & H. R. R., CYPHER STREET SIDING. RODS TO BE OF OPEN-HEARTH, NEW BILLET, MEDIUM STEEL, 36 FEET LONG, PLUS OR MINUS 1 INCH. AUGUST 5, 1915.

BIDDER.	Name of Rod.	Price per Ton.	Amount.	Time of Shipment,
Cambria Steel Company, 60 State Street, Boston, Mass.....	Slick	$29.78	$38,714.00	Commence in 60 days; finish 30 days later.
Concrete Steel Company, 7 Water Street, Boston, Mass.....	Havemeyer	29.78	38,714.00	Begin before September 15, 1915; complete by September 30, 1915.
Deformed Steel Bar Company, 70 Kilby Street, Boston, Mass.....	Slick	29.47	38,311.00	Begin 8 weeks from receipt of order; complete 30 days later.
Corrugated Bar Company, 220 Devonshire Street, Boston, Mass.....	Corrugated	28.78	*37,226.93	Begin September 1, 1915, if order is received by August 10, 1915.
Jones&Laughlin Steel Company, 131 State Street, Boston, Mass.....	Diamond	28.78	*37,226.93	Complete in week of August 16, 1915.
Arthur C. Harvey Company, 374 Congress Street, Boston, Mass.....	Gabriel	27.58	35,854.00	Will ship 500 tons within 4 weeks and complete 8 weeks from receipt of order.

*After deducting one-half of one per cent. for cash in 10 days.

APPENDIX K.

CANVASS OF BIDS FOR FURNISHING AND PLACING CONCRETE PLATFORM FINISH IN THE SCOLLAY UNDER STATION OF THE EAST BOSTON TUNNEL EXTENSION. (WORK TO BE COMPLETED ON OR BEFORE SEPTEMBER 21, 1915.) SEPTEMBER 2, 1915.

BIDDER.	150 cu. yds. concrete masonry for base, 2" or more in thickness.	1,800 sq. yds. granolithic wearing surface, 1" thick.	100 sq. yds. granolithic wearing surface, 1" to 3½" in thickness.	656 lin. ft. white cement edge, 6" wide and 2" thick.	Total.
	Item a	b	bb	c	
A. E. Daddario & Company, 51 Edgewater Drive, Mattapan, Mass	$8.00 1,200.00	$0.54 972.00	$0.75 75.00	$0.22 144.32	$2,391.32
Willis L. Learned, 108 Middle Street, Braintree, Mass	7.75 1,162.50	0.50 900.00	1.00 100.00	0.18 118.08	2,280.58
Hugh Nawn Contracting Company, 82 Savin Street, Roxbury, Mass	7.00 1,050.00	0.54 972.00	0.90 90.00	0.20 131.20	2,243.20
Albert I. Berry, 6 Beacon Street, Boston, Mass	7.00 1,050.00	0.50 900.00	0.50 50.00	0.22 144.32	2,144.32

APPENDIX L.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING AT STOCKYARD OF BOSTON TRANSIT COMMISSION, 14 CYPHER STREET, SOUTH BOSTON, 242 ANGLES AND 110 PLATES MADE OF OPEN-HEARTH STEEL, NUMBER OF PIECES ACCORDING TO SCHEDULE. SEPTEMBER 8, 1915.

APPENDIX M.

CANVASS OF BIDS FOR FURNISHING AND SETTING HALF TILE OF RIBBED TERRA COTTA AND FURNISHING AND APPLYING CEMENT PLASTER ON THE WALLS OF THE SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. SEPTEMBER 9, 1915.

BIDDER.	2,400 sq. yds. half tile of ribbed terra cotta, 2 inches thick.	1,500 sq. yds. of cement plaster, ¼-inch to ¾-inch in thickness, for straightening walls and partitions.	100 sq. yds. of cement plaster, ¾-inch to 1½ inches in thickness, for straightening walls and partitions.	Total.
	Item a	b	c	
Albert I. Berry, 6 Beacon Street, Boston, Mass.	$1.15 2,760.00	$0.50 750.00	$0.80 80.00	$3,590.00
Keith & Craffey, 816 Old South Building, Boston, Mass.	0.82 1,968.00	0.50 750.00	0.80 80.00	2,798.00

APPENDIX N.

CANVASS OF BIDS FOR 315 CAST-IRON BASE PLATES FOR SAFETY TREADS, (ABOUT 17,600 LBS.,) FURNISHED AND DELIVERED TO STOCKYARD OF BOSTON TRANSIT COMMISSION, 14 CYPHER STREET, SOUTH BOSTON, TO BE USED ON STAIRWAYS OF SOUTH STATION UNDER, DORCHESTER TUNNEL. OCTOBER 11, 1915.

BIDDER.	Lump Sum Price.	Time of Delivery.
Wollaston Foundry Company, Norfolk Downs, Quincy, Mass	$842.80	In 45 days.
Puritan Iron Works, 110 Portland Street, Boston, Mass	634.00	In 90 days.

APPENDIX O.

CANVASS OF BIDS FOR TAKING DOWN AND REMOVING THE BUILDINGS ON THE EASTERLY SIDE OF DORCHESTER AVENUE, BETWEEN WEST FOURTH STREET AND A STREET, SOUTH BOSTON. OCTOBER 14, 1915.

BIDDER.	Will remove the buildings and pay the Boston Transit Commission.
William Perry, 25 D Street, South Boston, Mass.	$175.00
South Bay Building Wrecking Company, 194 Dorchester Avenue, South Boston, Mass.	201.00
New York Building Wrecking Company, Inc., 43 Tremont Street, Boston, Mass.	255.00
Swift-McNutt Company, 70 Devonshire Street, Boston, Mass.	307.00
New England Building Wrecking Co., 17 Eustis Street, Roxbury, Mass.	347.00
New England Contracting Company, Corner Spruce and Third Streets, Chelsea, Mass.	376.00
William G. Greene & Sons, 26 Hampshire Street, Cambridge, Mass.	485.00

APPENDIX P.

CANVASS OF BIDS FOR REMOVING ABOUT 4,400 LINEAR FEET OF AIR DUCT FROM THE ARCH OF THE EAST BOSTON TUNNEL, BETWEEN ATLANTIC AVENUE STATION AND A POINT APPROXIMATELY 800 FEET WEST OF THE TUNNEL ENTRANCE AT MAVERICK SQUARE; ALL MATERIALS REMOVED TO BECOME THE PROPERTY OF THE CONTRACTOR. OCTOBER 14, 1915.

BIDDER.	Price per linear foot of duct.	Amount.	Time of Completion.
John E. Palmer, 1012 Old South Building, Boston, Mass.	$1.00	$4,400.00	December 15, 1915.
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	0.93	4,092.00	In 25 days.
Isaac Blair & Company, Inc., 433 Harrison Avenue, Boston, Mass.	0.65	2,860.00	In 30 days.
Willis L. Learned, 108 Middle Street, Braintree, Mass.	0.55	2,420.00	November 16, 1915.

APPENDIX Q.

CANVASS OF BIDS FOR FURNISHING AND ERECTING POLISHED GRANITE WALLS FORMING PART OF COVERINGS OVER FOUR STAIRWAYS AND THREE ESCALATORS, SOUTH STATION UNDER, DORCHESTER TUNNEL. OCTOBER 21, 1915.

BIDDER.	Lump Sum Price.	Kind of Granite.	Time of Completion.
The Jones Brothers Company, 161 Summer Street, Boston, Mass.	$14,350.00	Dark Quincy.	In 3 months.
The Jones Brothers Company, 161 Summer Street, Boston, Mass.	13,750.00	Dark Barre.	In 3 months.
Smith Granite Company, Quincy Adams, Mass.	9,460.00	J. S. Swingle's stock	Not stated.
Milne & Hector, Nightingale Avenue, Quincy Adams, Mass.	5,900.00	Medium Quincy.	In 8 to 10 weeks.
Rockport Granite Company, 31 State Street, Boston, Mass.	5,875.00	Rockport gray.	December 15, 1915
Deacon Brothers, Quincy, Mass.	5,549.00	Quincy.	In 6 weeks.
Lavers Granite Company, Copeland Street, Quincy, Mass.	5,400.00	Quincy.	In 8 to 9 weeks.

APPENDIX R.

CANVASS OF BIDS FOR FURNISHING AND SETTING WHITE ENAMELED TILE ON THE WALLS OF THE SCOLLAY SQUARE STATION OF THE TREMONT STREET SUBWAY. OCTOBER 26, 1915.

BIDDER.	460 sq. yds. of plaster backing, ¾-inch or less in thickness, for straightening walls.	50 sq. yds. of plaster backing, ¾-inch to 1½ inches in thickness, for straightening walls.	460 sq. yds. of 3" x 6" x 3/8" enameled tile.	Total.	Time of Completion.
	Item a	b	c		
Galassi Mosaic & Tile Company, 5 Ash Street, Boston, Mass	$0.90 414.00	$1.10 55.00	$4.95 2,277.00	$2,746.00	In 4 weeks.
Tyler-Wires Company, 120 Boylston Street, Boston, Mass	0.65 299.00	0.90 45.00	5.04 2,318.40	2,662.40	In 5 weeks.
Waldo Brothers, 45 Batterymarch Street, Boston, Mass	0.70 322.00	0.70 35.00	4.42 2,033.20	2,390.20	In 4 weeks.

APPENDIX U.

CANVASS OF BIDS FOR FURNISHING AND PLACING WALL FINISH IN SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. DECEMBER 16, 1915.

BIDDER.	1,200 sq. yds. of white terrazzo.	15 sq. yds. of black terrazzo for copings, parapet walls, etc.	180 sq. yds. of 3″ x 6″ blue enameled tile for borders.	200 sq. yds. of vitrified ceramic mosaic tile for borders and name panels.	250 lin. ft. of both blue and white vitrified mosaic bull nosed tile.	170 sq. yds. of gray cement plaster for advertising panels.	25 sq. yds. of preliminary plaster in excess of 1½″ in thickness, for straightening walls.	Total.
	Item a	b	c	d	e	f	g	
Waldo Brothers, Inc., 45 Batterymarch St., Boston, Mass.	$6.25 7,500.00	$7.50 112.50	$10.60 1,908.00	$10.60 2,120.00	$0.25 62.50	$0.60 102.00	$0.60 15.00	$11,820.00
L. L. Rinaldi & Company, 263 Atlantic Avenue, Boston, Mass.	5.25 6,300.00	18.00 270.00	8.10 1,458.00	9.15 1,830.00	0.72 180.00	0.95 161.50	0.65 16.25	10,215.75
DePaoli Mosaic Association, 19 Damrell Street, South Boston, Mass.	4.45 5,340.00	9.00 135.00	7.60 1,368.00	9.40 1,880.00	0.60 150.00	0.80 136.00	0.75 18.75	9,027.75
Galassi Mosaic & Tile Co., 5 Ash Street, Boston, Mass.	4.00 4,800.00	9.00 135.00	7.25 1,305.00	8.00 1,600.00	0.50 125.00	1.00 170.00	1.00 25.00	8,160.00

APPENDIX V.

CANVASS OF BIDS FOR FURNISHING MATERIALS FOR AND PLASTERING PORTIONS OF WALLS AND CEILINGS IN THE SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. DECEMBER 28, 1915.

BIDDER.	7,800 sq. yds. of plaster backing, ¼-inch to ¾-inch thick.	1,200 sq. yds. of plaster backing, ¾-inch to 1½ inches thick.	100 sq. yds of plaster backing, 1½ inches to 3 inches thick.	8,500 sq. yds. of white Portland cement plaster, ⅛-inch to ¼-inch thick.	700 sq.yds of gray finish plaster.	11,000 lin. ft. of arrises and exterior corners, ¼-inch radius.	2,500 lin. ft. of sanitary base, 15 inches high and 1½ inches thick, with curved base.	Total.
	Item a	b	c	d	e	f	g	
Robert Gallagher Co., 166 Devonshire St., Boston, Mass...	$0.52 4,056.00	$0.74 888.00	$1.15 115.00	$0.59 5,015.00	$0.68 476.00	$0.17 1,870.00	$0.65 1,625.00	$14,045.00
Alfred V. Day, 41 Worcester Sq., Boston, Mass...	0.55 4,290.00	0.85 1,020.00	0.90 90.00	0.57 4,845.00	0.50 350.00	0.15 1,650.00	0.43 1,075.00	13,320.00
Keith & Craffey, 816 Old South Bldg., Boston, Mass...	0.54 4,212.00	0.80 960.00	1.75 175.00	0.56 4,760.00	0.54 378.00	0.15 1,650.00	0.46 1,150.00	13,285.00

APPENDIX W.

CANVASS OF BIDS FOR FURNISHING 200 TONS OF REINFORCING RODS EQUAL IN SECTION TO 1¼ INCH SQUARE AND 300 TONS OF REINFORCING RODS EQUAL IN SECTION TO ⅞-INCH SQUARE, DELIVERED F. O. B. CARS BOSTON, VIA N. Y., N. H. & H. R. R., CYPHER STREET SIDING.
RODS TO BE OF OPEN-HEARTH, NEW BILLET, MEDIUM STEEL, 36 FEET LONG, PLUS OR MINUS 1 INCH.
JANUARY 4, 1916.

BIDDER.	Name of Rod.	Price per Ton.	Amount.	Time of Shipment.
Cambria Steel Company, 60 State Street, Boston, Mass	Slick	$53.78	$26,890.00	No promise inside of 3 months for open hearth, 4 to 6 weeks for Bessemer.
W. E. Clark & Company, 120 Milk Street, Boston, Mass	Gabriel	43.60	21,800.00	Ship in March and April.
Corrugated Bar Company, 220 Devonshire Street, Boston, Mass	Square Corrugated	42.78	*21,390.00	Before March 31, 1916.
Concrete Steel Company, 7 Water Street, Boston, Mass	Havemeyer	40.78	20,390.00	Before March 31, 1916.
Jones & Laughlin Steel Company, 131 State Street, Boston, Mass	Diamond	39.78	*19,890.00	In 4 or five months.

*Discount one half of one per cent for cash in 10 days.

APPENDIX X.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING, FREIGHT PREPAID, TO CYPHER STREET STOCKYARD, SOUTH BOSTON, 216 PLATES 15″ x ½″ x 15′-6″. AND 216 PLATES 15″ x ½″ x 21′-6″. JANUARY 4, 1916.

BIDDER.	Price per ton.	Amount.	Time of Shipment.
Lukens Iron & Steel Company, 131 State Street, Boston, Mass.	$50.78	$5,179.56	In 2 or 3 months if furnace heat number is not required.
Cambria Steel Company, 60 State Street, Boston, Mass	48.78	4,975.56	In 3 or 4 months if furnace heat number is not required.
W. E. Clark & Company, 120 Milk Street, Boston, Mass.	48.60	4,957.00	25% in 2 or 3 weeks. Balance in 2 to 4 months.
Central Iron & Steel Company, 131 State Street, Boston, Mass.	43.78	4,465.56	Ship in 2 weeks from receipt of order at mill. Conditional on railroad embargo.
Carnegie Steel Company, 120 Franklin Street, Boston, Mass.	40.78	4,159.56	No definite promise. Will try to ship in 4 to 6 months if furnace heat number is not required.

APPENDIX BB.

CANVASS OF BIDS FOR FURNISHING AND ERECTING OAK HANDRAILS COMPLETE WITH BRONZE BRACKETS AND CAST IRON POSTS IN THE SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. MARCH 7, 1916.

BIDDER.	645 lin. ft. 2″ oak handrail.	425 lin. ft. 2½″ oak handrail.	121 bends of 2″ oak handrail.	44 bends of 2½″ oak handrail.	139 bronze brackets.	64 bronze sockets.	80 cast iron posts.	Total.
	Item a	b	c	d	e	f	g	
Albert I. Berry, 6 Beacon Street, Boston, Mass	$0.40 258.00	$0.50 212.50	$1.65 199.65	$2.00 88.00	$3.00 417.00	$2.50 160.00	$6.25 500.00	$1,835.15
Anderson & Letteney, 21 Wareham Street, Boston, Mass	0.40 258.00	0.48 204.00	0.43 52.03	1.50 66.00	2.85 396.15	2.50 160.00	6.35 508.00	1,644.18
O. H. Drisko & Son, 166 Devonshire Street, Boston, Mass	0.35 225.75	0.40 170.00	1.44 174.24	1.68 73.92	2.36 328.04	1.92 122.88	6.52 521.60	1,616.43

APPENDIX CC.

CANVASS OF BIDS FOR FURNISHING 25 TONS OF 7/8" BUTTON-HEAD RIVETS, DELIVERED AT STOCKYARD OF BOSTON TRANSIT COMMISSION, 14 CYPHER STREET, SOUTH BOSTON. MARCH 8, 1916.

BIDDER.	Price per Pound.	Amount.	Time of Delivery.
Arthur C. Harvey Company, 374 Congress Street, Boston, Mass..	4.15c.	Only 4,500 lbs. bid on.	Immediate delivery from Boston stock.
Wm. E. Clark, Lessee, New England Bolt and Steel Company, Everett, Mass	3.25c. f.o.b. Pittsburgh, 0.18c. freight 3.43c.	$1,715.00	Shipment in about 4 weeks.
Fred A. Houdlette & Son, Inc., 93 Broad Street, Boston, Mass	3.20c.	1,600.00	Shipment in 4 to 6 weeks.

APPENDIX EE.

CANVASS OF BIDS FOR FURNISHING AND ERECTING IRON FENCES AND GATES IN THE SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. APRIL 13, 1916.

BIDDER.	4 folding gates, Bostwick type.		62 lin. ft. iron fence for stairway.	8 lin. ft. iron fence for parapet wall.	2 swinging iron gates.	Total.
	Item a		b	c	d	
	Per Gate.	Amount.	Lump Sum.	Lump Sum.	Lump Sum.	
Zenas R. Taylor, 12 Elkins Street, South Boston, Mass.	$185.00	$740.00	$810.00	$76.00	$194.00	$1,820.00
Norfolk Iron Company, Norfolk Downs, Quincy, Mass.	106.00	424.00	673.00	45.00	75.00	1,217.00
Oliver Whyte Company, Inc., 23 Cornhill, Boston, Mass.	140.00	560.00	450.00	62.00	106.00	1,178.00
W. A. Snow Iron Works, Inc., 19 Portland Street, Boston, Mass.	90.00	360.00	372.00	35.00	110.00	877.00

APPENDIX FF.

CANVASS OF BIDS FOR REMOVING BUILDING 563-571 INCLUSIVE, DORCHESTER AVENUE, SOUTH BOSTON. APRIL 13, 1916.

BIDDER.	Will remove the building and pay the Boston Transit Commission.
John S. Lawler, 16 City Square, Charlestown, Mass.	$160.00
New England Contracting Company, Corner Spruce and Third Streets, Chelsea, Mass.	207.50
Thomas A. Elston Company, Inc., 370 Dorchester Avenue, South Boston, Mass.	210.00
New York Bldg. Wrecking Company, Inc., 43 Tremont Street, Boston, Mass.	337.50
William G. Greene & Sons, 26 Hampshire Street, Cambridge, Mass.	355.00
William Perry, 25 D Street, South Boston, Mass.	527.50
Swift-McNutt Company, 70 Devonshire Street, Boston, Mass.	675.00

APPENDIX GG.

CANVASS OF BIDS FOR FURNISHING 333 CASTINGS (ESTIMATED WEIGHT 28,400 LBS.) AND DELIVERING SAME TO STOCKYARD OF THE BOSTON TRANSIT COMMISSION, 14 CYPHER STREET, SOUTH BOSTON. (CASTINGS TO BE USED ON SECTIONS F AND J, DORCHESTER TUNNEL.) APRIL 18, 1916.

BIDDER.	Price Per Pound.	Amount.
Boston Casting Company, 156 Pearl Street, Boston, Mass.	$0.065	$1,846.00
Nashua Co-operative Iron Foundry, Nashua, N. H.	0.05625	1,597.50
Barbour-Stockwell Company, 205 Broadway, Cambridgeport, Mass.	0.055	1,562.00
Gibby Foundry Company, Condor Street, East Boston, Mass.	0.045	1,278.00
Milford Iron Foundry, Milford, Mass.	*0.04062	1,153.61

*This price per pound is deduced from the piece prices which were bid.

APPENDIX HH.

CANVASS OF BIDS FOR REMOVING BUILDINGS ON DEXTER STREET AND DEXTER PLACE, SOUTH BOSTON. AMOUNTS TO BE PAID TO THE BOSTON TRANSIT COMMISSION AND THE BUILDINGS TO BECOME THE PROPERTY OF THE BIDDER.
APRIL 27, 1916.

BIDDER.	10 Dexter Street.	12 Dexter Street.	14 Dexter Street.	16 Dexter Street.	18 Dexter Street.	1 Dexter Place.	3 Dexter Place.
	Item a	b	c	d	e	f	g
Burton M. Lawler, 16 City Square, Charlestown, Mass.	$41.00	$41.00	$41.00	$46.00	$46.00	$51.00	$51.00
New York Bldg. Wrecking Co., Inc., 43 Tremont Street, Boston, Mass.	45.00	45.00	45.00	45.00	45.00	45.00	45.00
William G. Greene & Sons, 26 Hampshire Street, Cambridge, Mass.	60.00	60.00	60.00	60.00	60.00	45.00	45.00
Henry G. Hoppe, 500 Southampton Street, South Boston, Mass.	No bid.	No bid.	No bid.	*405.00	*405.00	No bid.	No bid.
Swift-McNutt Company, 70 Devonshire Street, Boston, Mass.	65.00	*65.00	*65.00	65.00	65.00	65.00	65.00
Niels Anderson & Company, 64 Alexander Street, Dorchester, Mass.	*100.00	No bid.	No bid.	No bid.	No bid.	*100.00	*100.00

*Awarded contract.

APPENDIX KK.

CANVASS OF BIDS FOR FURNISHING AND SETTING COPPER COVERED DOORS AND FRAMES AND COPPER COVERED PARTITIONS AND TRANSOMS WITH COPPERED FRAMES, AT THE SOUTH STATION UNDER OF THE DORCHESTER TUNNEL. JUNE 28, 1916.

BIDDER.	Work in enclosures over escalators in Atlantic Avenue and Federal Street.	Work in enclosure over escalator in Summer Street.	Total.	Time of Completion.
Penn Metal Company, 201 Devonshire Street, Boston, Mass.	$542.00	$310.00	$852.00	In 1 month.
E. Van Noorden & Company, 100 Magazine Street, Boston, Mass.			795.00	
The T. J. Flynn Metal Works, Inc., Albany and Portland Streets, Cambridge, Mass.	200.00 each= 400.00 for both.	300.00	700.00	In 40 working days.


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